Social and Economic Research Project Reports *No. 4*

Malaria Control through Community Action at the Grass-Roots: Experience of the Sarvodaya Malaria Control Research Project in Sri Lanka from 1980 to 1986

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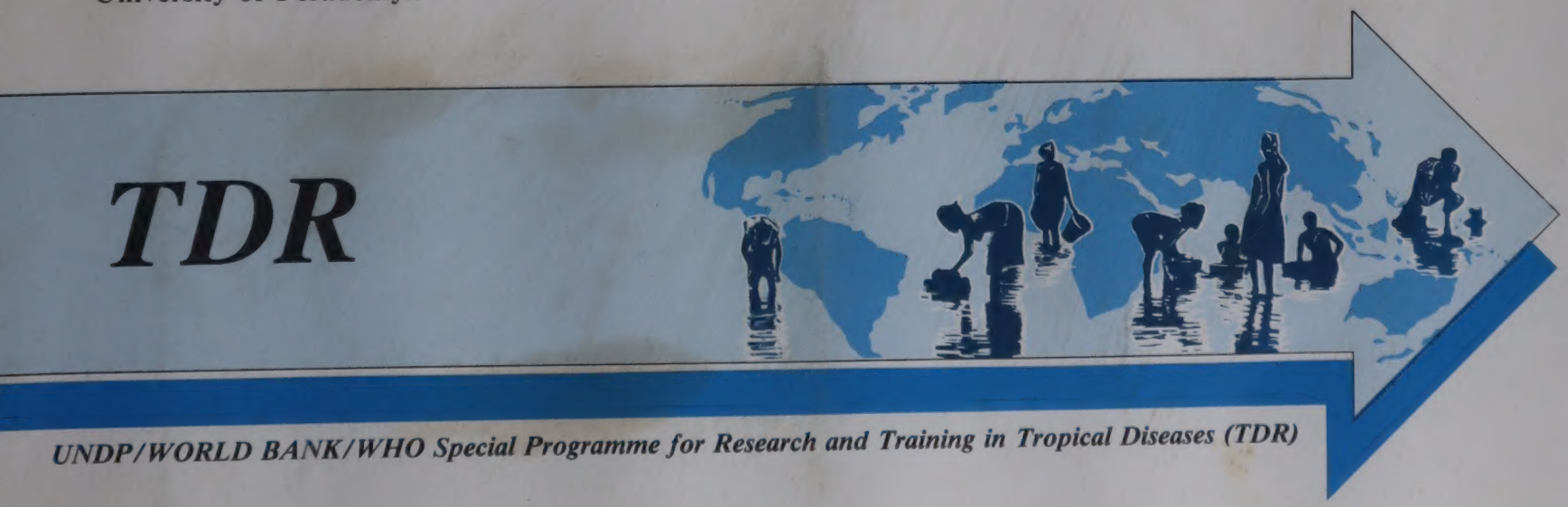

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UNDP/WORLD BANK/WHO Special Programme for Research and Training in Tropical Diseases (TDR)

TDR/SER/PRS/4

SER Project Reports appear as part of a series of unedited final reports resulting from projects supported by the UNDP/WORLD BANK/WHO Special Programme for Research and Training in Tropical Diseases (TDR). These reports are submitted to the TDR Steering Committee on Social and Economic Research for review and evaluation upon completion of a project. Project reports included in this series have not been published in their entirety elsewhere.

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Foreword

The UNDP/WORLD BANK/WHO Special Programme for Research and Training in Tropical Diseases (TDR) is a globally coordinated effort to bring the resources of modern science to bear on the control of major tropical diseases. The Programme has two interdependent objectives:

- To develop new methods of preventing, diagnosing and treating selected tropical diseases, methods that would be applicable, acceptable and affordable by developing countries, require minimal skills or supervision and be readily integrated into the health services of these countries;

- To strengthen -- through training in biomedical and social sciences and through support to institutions -- the capability of developing countries to undertake the research required to develop these new disease control technologies.

Research is conducted on a global basis by multidisciplinary Scientific Working Groups on the six diseases selected for attack: malaria, schistosomiasis, filariasis (including onchocerciasis), the trypanosomiases (both African sleeping sickness and the American form, Chagas' disease), the leishmaniases and leprosy. Scientific Working Groups are also active in the "trans-disease" areas of biological control of vectors, epidemiology, and social and economic research. The training and institution strengthening activities are limited to the tropical countries where the diseases are endemic.

The *Social and Economic Research Project Reports* series represents a new communication venture undertaken by TDR's Social and Economic Research (SER) Component. This series has been launched to facilitate and increase communication among social scientists and researchers in related disciplines carrying out research on social and economic aspects of tropical diseases and to disseminate social and economic research results to disease control personnel and government officials concerned with improving the effectiveness of tropical disease control.

Research reports published in this series are final reports of projects funded by TDR and usually include more material than ordinarily published in peer review journal articles. TDR considers this material to be valuable both for investigators involved in the study of social and economic aspects of tropical diseases and for professionals involved in training programmes in the social sciences, economics and public health. The series should acquaint those working on similar problems with approaches undertaken by others, in order to test new approaches in different settings, and should provide useful information to personnel in disease control programmes and related agencies.

All requests for further information should be addressed to: Dr C. Vlassoff, Secretary, Steering Committee on Social and Economic Research, TDR, World Health Organization, 1211 Geneva 27, Switzerland.

Tore Godal, Director

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PREFACE

Since 1979 the Social and Economic Research (SER) Component of the UNDP/WORLD BANK/WHO Special Programme for Research and Training in Tropical Diseases (TDR) has been supporting research aimed at improving the effectiveness of disease control programmes through the incorporation of social, cultural and economic factors into the design and implementation of control programme activities. In aiming towards this overall final objective, two intermediate objectives guide TDR's social and economic research activities:

- To determine the impact of social, cultural, demographic and economic conditions on disease transmission and control.

- To promote the design and use of cost-effective and acceptable disease control programmes and policies.

The study undertaken by Dr Silva and his team responds directly to the second intermediate objective in that it addresses the issue of malaria control through community participation. The Sarvodaya project described in this report demonstrates the strengths and weaknesses of using a popular voluntary organization to initiate and sustain disease control efforts in rural Sri Lanka. For example, the study found that trained Sarvodaya workers were able to identify vector breeding sites and carry out continuous vector surveillance of a rudimentary nature. However, it proved unrealistic to expect these workers to undertake parasite and epidemiological surveillance under existing conditions.

Three vector control interventions - filling and draining vector breeding sites, introduction of larvivorous fish and the application of a larvicidal agent, monoxci - carried out in the selected communities produced encouraging results. The researchers hope to develop and test these interventions further by combining them with one another and with other potentially effective methods.

A valuable aspect of the study is its candid discussion of the hurdles experienced in attempting to coordinate the work of community-level organizations and the national malaria control programme, but significant progress seems to have been made in this regard. At a regional meeting on integrated vector control held in Sri Lanka in 1986 this project was recommended as a useful model of community participation for the Asian region.

Carol Vlassoff, Secretary
Scientific Working Group and Steering Committee
on Social and Economic Research

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A LIST OF ABBREVIATIONS USED

AMC	= Anti-Malaria Campaign
AMP	= Assistant Medical Practitioner
CO	= Community Organizer
EA	= Entomological Assistant
FA	= Field Assistant
FHW	= Family Health Worker
FS	= Fever Survey
GR	= Geographical Reconnaissance
ISTI	= International Science and Techology Institute
IVC	= Integrated Vector Control
MBS	= Mass Blood Survey
MOH	= Medical Officer of Health
NGO	= Non-Government Organization
PCD	= Passive Case Detection
P.f.	= Plasmodium falciparum
PHC	= Primary Health Care
PHI	= Public Health Inspector
P.v.	= Plasmodium vivax
RMP	= Registered Medical Practitioner
SACEP	= South Asian Cooperative Environment Programme
SMCRP	= Sarvodaya Malaria Control Research Project
SRO	= Sub-Regional Office
SSM	= Sarvodaya Shramadana Movement
TDR	= UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases
USAID	= United States Agency for International Development
VLW	= Village Level Worker
WHO	= World Health Oganization

CHAPTER ONE

INTRODUCTION

1. Statement of the Problem

The research and development efforts connected with the conventional malaria eradication strategy were mainly concerned with how to enhance the capability of a centrally-administered vertical programme to progressively eliminate the disease within a specified time period. As is well known, by now the malaria eradication strategy has encountered a series of technical, operational and sociological problems which are of an insurmountable nature; among them the growing vector and parasite resistance to available synthetic insecticides and drugs respectively, the growing human resistance to repeated spraying of residual insecticides within their homes and the increasing costs of insecticides and drugs (Bruce Chwatt 1969, Brown et al. 1975, Farid 1980).

In response to the failure of the conventional malaria eradication strategy to satisfactorily deal with the persistent malaria problem in many parts of the world, two related community-oriented approaches are currently being developed: Integrated Vector Control (IVC) and the Primary Health Care (PHC) approach to malaria control. Under IVC an economical use of a variety of appropriate means to reduce vector densities is proposed (WHO 1983). Among other things the PHC strategy seeks to enhance community participation in malaria control and strengthen the capacities of peripheral health services for early diagnosis and treatment of the disease (WHO 1984). Both IVC and PHC strategies necessitate a considerable decentralization of control operations and a corresponding readjustment of the decision-making process related to disease control (Hongvivatana 1982, Pant & Rosenfield 1986).

The research and development efforts linked with IVC and PHC strategies in malaria control must necessarily address the following issues.

1. How to enhance the capabilities of local communities in malaria endemic regions to contain and cope with the disease in a viable and effective manner. For this purpose it is necessary to understand both the bio-environmental and socio-economic processes related to the transmission and control of the disease in the localities concerned (Etkin 1979, Hongvivatana 1982).

2. What organizational framework is best suited to induce local communities for cooperative/collective action required for successful control of malaria in the respective localities. In this regard it is important to identify the potential contribution to malaria control by both the relevant Government Organizations and the Non-Government Organizations (NGOs) including voluntary organizations active in the malaria endemic areas.

As NGOs are known to be an effective medium for motivating and mobilizing local communities towards achieving collective goals, the present study examines the contribution by the Sarvodaya Shramadana Movement (SSM), a popular NGO in Sri Lanka, towards the development of a community-based system of malaria control and surveillance in a selected malaria endemic region in Sri Lanka.

In the light of the above considerations the main problem addressed in the present study is how to bring about a malaria control and surveillance capacity within endemic villages that is effective, viable and complementary to the efforts of a national malaria control programme. This is to be evolved in line with the principles of PHC and IVC. For this purpose the efficacy of selected vector control interventions and their suitability for application at the community level will be assessed and the relevant bio-environmental, and socio-cultural issues will be addressed. Finally the role of a popular NGO in promoting community participation in malaria control and its effects will be monitored.

2. The Project Objectives

The original project objectives as outlined in the project protocol prepared in 1981 were as follows:

- determine how villagers can identify breeding sites of the malaria vector Anopheles culicifacies throughout an annual cycle,
- determine how traditional healing medicines or methods prevent people from being exposed to malaria infection,
- determine the kind of practices, customs and artifacts that culture has developed to reduce malaria infection,
- determine how community action can best reduce effective vector breeding sites and the frequency of exposure to vectors capable of transmitting malaria.

In subsequent years the project objectives were revised and expanded to include the following additional objectives:

- bring malaria control at the village level under the ambit of Primary Health Care,
- expand the scope of the community-based surveillance system to cover all illnesses and other health related events in the relevant households,
- determine the management capacity of a NGO to implement a community-based primary health care programme including malaria control.

Map 1: Map of Sri Lanka Showing Ecological and Malaria Zones and the SMCRP Project Area

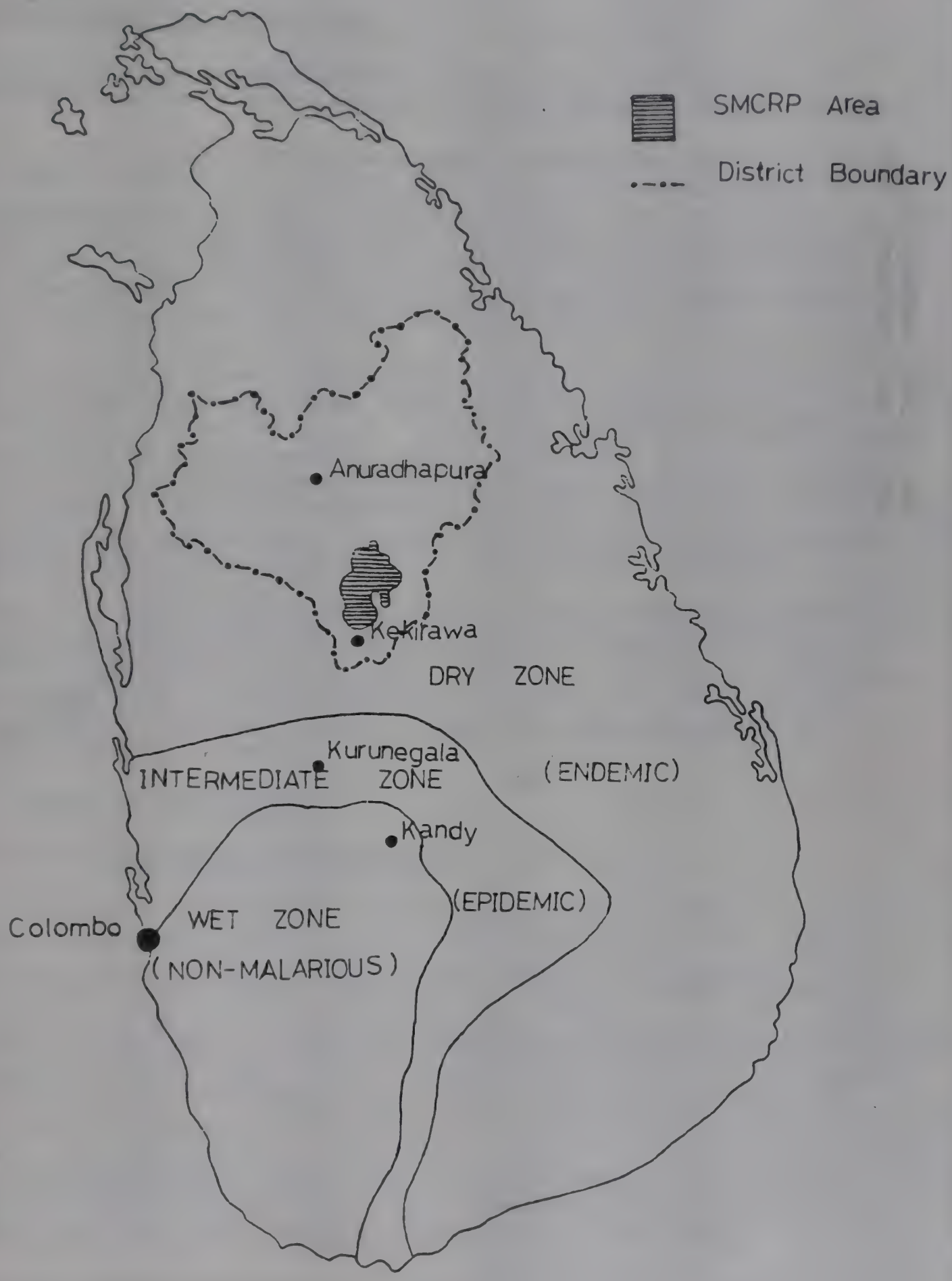
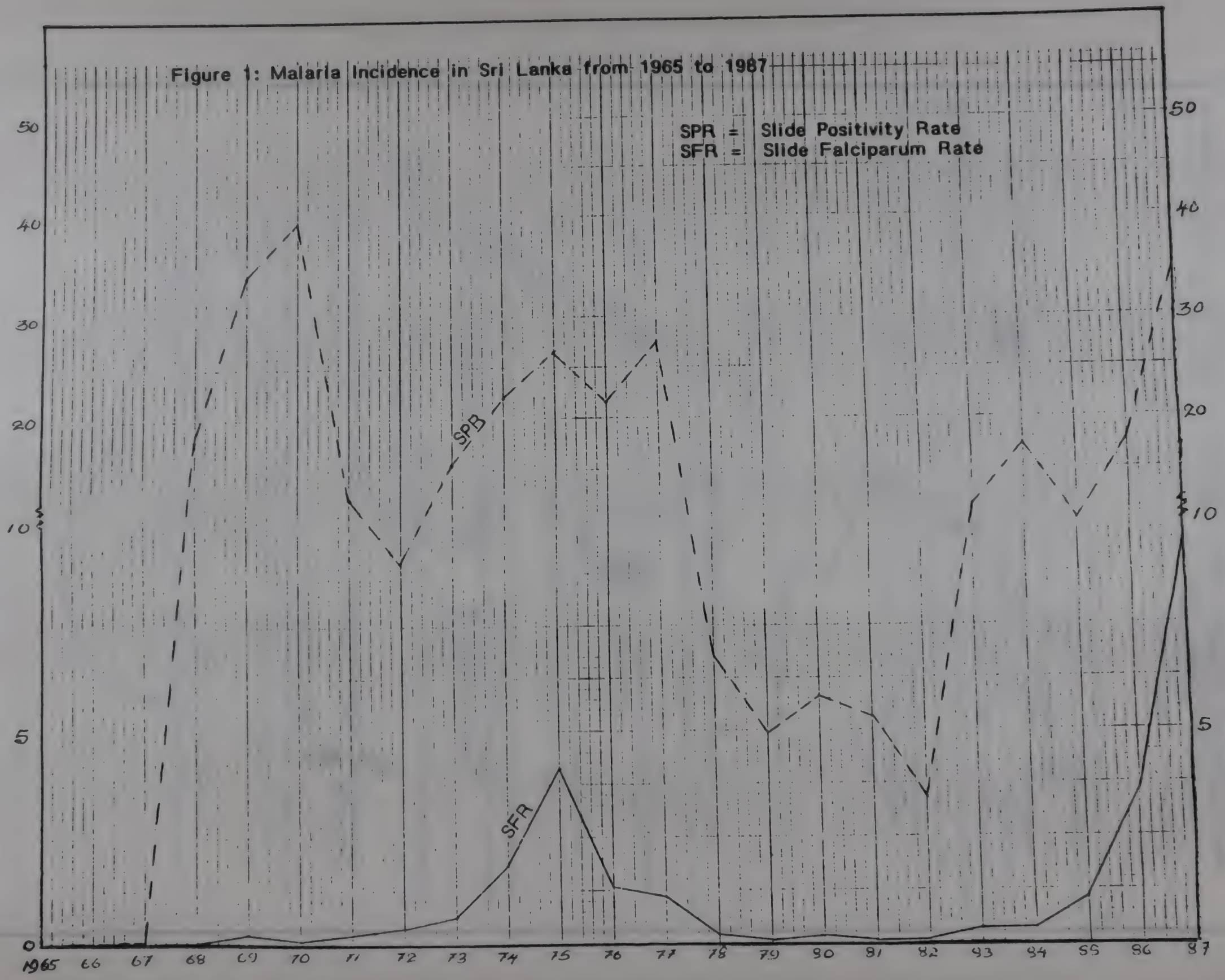


Figure 1: Malaria Incidence in Sri Lanka from 1965 to 1987



Thus in sum the project aims at identifying the elements of a suitable first level of prevention and control of malaria applicable to endemic local communities. In its planning stages the project had an additional objective of collaborating with the government Anti-Malaria Campaign (AMC) in its spray programme, but later this objective was abandoned due to operational difficulties.

3. The Underlying Assumptions

The following assumptions have been critically important in the development of the Sarvodaya Malaria Control Research Project (SMCRP).

1. In a malaria control programme the continued routine application of chemical insecticides on a large scale is both wasteful and counter-productive in that it may result in the loss of available chemical tools due to ever-increasing vector resistance. The best long term strategy for the use of available chemical insecticides is to apply them only when necessary i.e. in peak malaria seasons of the year and where conditions favourable to a malaria epidemic prevail.

2. The continuous low grade transmission of malaria in endemic areas helps maintain immunity levels among the people which in turn protect them from serious illness and death. On the other hand much damage is caused by periodic epidemics resulting mainly from sudden increases in vector density usually associated with certain climatic conditions. Moreover, the attempt to interrupt transmission aggressively by insecticide spraying and mass drug administration inhibits immunity levels among the people and thereby renders them vulnerable to serious malaria epidemics.

3. The malaria control efforts at all levels must primarily aim at prevention and control of malaria epidemics, elimination of malaria deaths, prevention of complications resulting from malaria infections, especially among pregnant mothers and children, and, where necessary, suppression of malaria symptoms through the administration of the recommended drug regime.

4. Background Description

4.1 Epidemiological Background

Malaria is a major public health problem in Sri Lanka. Out of the country's population of 15 million, about 10 million are at risk for malaria. It is endemic or hyperendemic in the dry zone comprising two-thirds of the country (see map 1). Its socio-economic impact is highest in those parts of the dry zone where heavy investments have been made in recent years in irrigation development and accompanying settlement programmes. Often there is no continuous transmission of the disease in the climatically intermediate zone which, however, is periodically affected by outbreaks of malaria epidemics occuring at intervals of 3 to 6 years. The densely populated wet zone consisting of the central highlands and the South-Western coastal belt is by and large free from malaria. Some of the more devastating malaria epidemics in the past, however, spread over the entire country inclusive of the wet zone.

According to some historians malaria was a key factor in the demise of the ancient hydraulic civilization in the dry zone and a resulting population movement towards the wet zone (Nicholls 1921). Although there is no reference to the disease in Mahawamsa and other ancient chronicles, it is possible that the disease was continuously present in parts of the dry zone from ancient times. The disease proved to be a considerable menace to the successive colonial powers in the country (Uragoda 1987). Much attention was focussed on the disease following the devastating malaria epidemic of 1934/35 costing an estimated 80,000 lives (Briercliffe 1935). Due to successful application of DDTs since 1945 there was a dramatic decline in malaria incidence in Sri Lanka between 1953 and 1963. This, however, proved to be a temporary success as Sri Lanka has experienced a dramatic resurgence of the disease since 1966 (Sivaganasundram 1971).

Figure 1 shows that, except for the period from 1978 to 1982, malaria incidence in the country remained at very high levels since 1968. It rose to epidemic proportions during 1968 to 1970, 1973 to 1977 and 1986 to 1987. As for the species prevalence both P.v. and P.f. are presently prevalent in Sri Lanka. An alarming new trend is that both the number and proportion of P.f. cases show a marked increase since 1985. Despite the rise in P.f. incidence surprisingly few malaria deaths have been reported in recent years.

The known vector for malaria in Sri Lanka is A.culicifacies* (A.c.) which breeds mostly in unpolluted shallow stagnant water exposed to sunlight. Its peak breeding season in the endemic dry zone is from October to January, corresponding with the peak rainfall season in the dry zone. This results from the proliferation of surface pools conducive to A.c. breeding due to heavy NE monsoon rains affecting the dry zone in these months. The dry zone has a long dry spell from February to September only disturbed by unreliable mid-year rains occurring in certain years. The vector appears to be well-adapted to surviving this long drought in the dry zone by utilizing a variety of breeding sites including river beds, wells and possibly suitable irrigation works. Following the above rainfall pattern, which in turn determines both the level of vector breeding and the annual agricultural cycle influencing human exposure to the disease, the peak malaria incidence in the dry zone is from October to January, followed by a secondary and less predictable peak in malaria incidence probably associated with drought in June or July each year. During the rest of the year there is continuous low grade transmission of malaria in many parts of the dry zone.

Normally the vector does not breed in abundance in intermediate and wet zones. However, in the intermediate zone epidemics of malaria occur during unusually long and severe droughts mainly as a result of pooling of rivers and the consequent build up of vector breeding along river beds. Thus there are vastly different patterns of malaria transmission in the endemic dry zone and the intermediate epidemic zone.

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* However several other anopheline species including A.subpictus and A.nigerrimus are suspected to be important secondary vectors for malaria under certain circumstances in parts of Sri Lanka. The AMC is monitoring this closely.

In its resumed struggle against the disease, the AMC of Sri Lanka initially responded by a reinvigoration of the control measures available at the time; indoor spraying of DDT and case detection and treatment using the existing machinery. However, due to vector resistance, the use of DDT was gradually abandoned since 1974 (Wickramasinghe 1981). Its successor malathion too is likely to be ineffective in time to come due to vector resistance. In 1987 a sum of Rs. 150 million, comprising about 54 percent of the entire government allocation to the AMC, was spent on malathion.* Presently malathion is obtained with the help of foreign aid and there is no guarantee of continued foreign assistance for this purpose.

On the other hand there are reports of gross misuse of malathion in rural areas interfering with the spray programme of the AMC. People's cooperation with spraying has rapidly deteriorated over the years; in 1985 only 54% of the targeted houses were fully sprayed mainly due to lack of cooperation on the part of the public.**

Chloroquine resistant strains of P.f. have been detected in parts of Sri Lanka since 1984. Poor compliance with drug therapy on the part of the patients and lack of cooperation on the part of the practitioners for the drug regime recommended by the AMC are also posing a considerable threat. A survey conducted in 1985 revealed that many inhabitants of malarious areas have misgivings about the efficacy of both insecticides and the anti-malarials currently in use. (Lanka Market Research Bureau 1985).

Finally malaria control operations are adversely affected by two recent developments in the country (AMC 1987). First, there has been a massive influx of people from non-malarious into malarious areas under the Accelerated Mahaweli Development Programme started in 1977. Second, the unsettled conditions prevailing in parts of Sri Lanka since 1983 have hindered AMC operations in those areas.

The AMC is fully sensitive to these problems. Since 1982 an effort has been made to rationalize the use of malathion through a stratification of areas requiring perennial, seasonal and focal spraying. The highest priority has been given to new settlements under the Mahaweli programme in view of their vulnerability to the disease and importance for economic development. A shift towards IVC is being envisaged (Herath 1985). Intersectoral collaboration in malaria control including the support of the NGOs has been actively sought since 1985.*** The current AMC thinking is reflected in the following remarks by a senior entomologist in the AMC.

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* Estimates of Revenue and Expenditure. Colombo: Government of Sri Lanka, 1987.

** Administration Report of the AMC, 1985, p.31.

*** See Ministry of Health, AMC, USAID, ISTI 1986, 1987 and 1987.

"Malaria has now become a major national problem. Our efforts in its control can no longer continue to rely only on the use of residual insecticides but need the appropriate use of all available or potential vector control methods on an integrated approach. This can only be effectively implemented through inter-sectoral collaboration and community participation at all levels." (Herath 1987:1)

The SMCRP is a response from a leading NGO in Sri Lanka to this national problem.

4.2 The Project Area

The project area lies in the eastern part of the Anuradhapura District which is hyperendemic for malaria (see map 1). It is about 80 square km in size and has a population of about 17,500 distributed in a total of 60 villages. A vast majority of the local inhabitants are Sinhalese Buddhists followed by Muslims and a handful of Sinhalese Catholics.

Though bounded by trunk roads linking Kekirawa and Anuradhapura on its west and Kekirawa and Galenbindunuwewa on its east (see map 2), the project area is very remote and much covered with jungle. The largest town within the area is Yakalla (pop. 680), followd by Maradankadawala (pop. 608). The project head office is at Olukaranda near Kekirawa town (pop. 11,073), situated just outside of the project area. The area consists of 4 Sarvodaya Divisions, each consisting of about 15 villages (see map 2).

The weather conditions in the project area are typical of the dry zone. Its average annual rainfall is about 1500 mm. Most of it is confined to the NE monsoonal period from October to January. There is a less reliable secondary peak in rainfall around May each year. A long drought prevails throughout the other months. In consequence irrigation is necessary for cultivation of paddy, the staple food of the local population. Each village in the area has evolved over generations one or more village reservoirs (tanks) of varying sizes and an accompanying system of water management that makes the inhabitants of each village mutually interdependent (Leach 1961). The project area is drained by the river Malwatu Oya which feeds the Nachchiyaduwa main tank situated just outside the project area.

The villages in the area are known as purana (ancient) villages. This signifies their continuity with the past and ancient cultural traditions. Further, ruins of ancient civilizations are found throughout this part of Sri Lanka. Each local village is typically small, relatively isolated and surrounded by a jungle used by the villagers for chena cultivation, a form of swidden agriculture. Up to now this area remains relatively untouched by any large scale development schemes introduced by the government.

This relatively insulated dry zone area was chosen for this study due to several reasons. First, this was considered a reasonably good setting for uncovering long standing cultural adaptations to malaria on the part of the inhabitants of purana villages. Second, as they are small and

stable communities with a long history of exposure to the disease the purana villages of this area were considered an appropriate setting for developing a community-based system of malaria control and surveillance envisaged in the study. Third, as a NGO, the SSM has gained much experience in working in this kind of backward area, particularly in the Anuradhapura District.

4.3 The Sarvodaya Shramadana Movement

The Sarvodaya Shramadana Movement (SSM) is a popular voluntary organization in Sri Lanka. Founded and led by A.T. Ariyaratne, a charismatic leader, it evolved from a community based educational effort of a leading public school in Colombo since 1958, under the influence of the Sarvodaya Movement in India. In 1967 the SSM selected 100 backward communities distributed in various parts of Sri Lanka and initiated various self-help development activities in these communities. In January 1972 the Movement was recognized by an Act of Parliament. Since 1977 there has been an active collaboration between the SSM and certain government organizations in community development, public health and social welfare. By the end of 1986, the SSM had over 7000 full time workers under the SSM and its activities had spread to nearly 8000 of Sri Lanka´s 22,000 villages.

Like its mother organization in India, the SSM is deeply committed to the Gandhian ideals of non-violence and self-reliance. During its growth it has been further influenced by Buddhist values cherished in Sri Lanka (Macy 1983). Sarvodaya meaning ´awakening of all´ is the ultimate goal of all the activities. The movement perceives the awakening of human being (paurushodaya), village (gramodaya), nation (deshodaya) and the world (vishvodaya) as progressive steps in this process. The Sarvodaya model is different from both the capitalist and socialist models of development. Besides material advancement, it stresses social harmony and moral upliftment of society. It advocates small scale production based on intermediate technology. It strives to fulfil 10 basic human needs including satisfactory mental and physicial health and a healthy environment. The movement´s mass appeal is largely due to its holistic approach to development, the inspiration it has received from indigenous culture and its charismatic leadership.

In the Sarvodaya philosophy ´shramadana´ (sharing or donation of labour usually for creation of public amenities) is seen as a means to achieve the goal of ´Sarvodaya´. Sarvodaya work in a village usually begins with a shramadana camp where people work together to build a road, public building, or to fulfil another felt need of the community. Where the communities show a further interest in Sarvodaya programmes, certain basic services are provided, usually by local volunteers trained by the SSM. Such facilities include pre-schools, health centres, income generating projects, etc. Finally an effort is made to create in each village a harmonious organizational structure consisting of a Children´s Group (Lama Hawula), a Youth Group (Yovun Hawula), a Mother´s Group (Mau Hawula), an Elders´ Group and occupational groups such as Farmers´ Group (Govi Hawula). The representatives of each of these groups make up the Shramadana Samithiya, a village level body monitoring and coordinating all Sarvodaya activities in a given village.

The SSM began a nationwide community health programme in 1976. Training of PHC workers, building of latrines and wells and health and nutritional education are important aspects of the SMM community health programme. The SSM has been involved in community-based epilepsy control and surveillance in several parts of Sri Lanka since 1981. Since most dry zone villages where Sarvodaya is active are malaria endemic, the SSM came to include malaria control in its overall effort to improve the quality of life among the rural population concerned.

CHAPTER TWO

THE RESEARCH PROCESS

1. The Research Design

One of the chief results being sought from this project is the evidence that interventions carried out by village communities have a significant effect on vector density, and hence on transmission of malaria. This means that the relevant interventions must be carried out under controlled conditions enabling the measurement of their outcome as related to changes in vector density and malaria incidence. Therefore, the SMCRP was conducted in the form of a field experiment in a normal community setting with Sarvodaya as the mobilizer of required community action. The scientific monitoring of the interventions and their results was done by outside scientists working closely with Sarvodaya workers who are in direct contact with the relevant communities. Once the effectiveness of the relevant interventions were scientifically established, it was envisaged that the SSM would gradually implement them on a wider scale.

Further, the project envisaged a systematic understanding of existing customs and cultural practices relevant to transmission and control of malaria in the relevant communities including folk concepts of malaria with a view to utilize or modify them for the purpose of enhancing the effectiveness of the proposed malaria control interventions. In order to achieve this particular objective it was necessary to conduct relevant social anthropological investigations side by side with the field experiment. Other areas for behavioural science research included how local communities perceived and responded to the SMCRP, the nature of local Sarvodaya organization itself and questions about its long term viability.

2. Phases of the Study

According to the initial plans prepared in 1981, the project was to be completed in three phases defined as follows:

The planning and exploratory phase - 9 months.

Test of hypothesis - 24 months.

Data analysis and report writing - 6 months.

However, as the project activities did not proceed according to plan between November 1981 and December 1982, in January 1983 the project phases were reformulated as follows:

The preparatory phase - 9 months.

The exploratory phase - 12 months.

The definitive or implementation phase - 15 months.

Whether this revised plan was intended to take effect from January 1983 or some earlier date is not clear from available documents.

In retrospect, it is more appropriate to designate the whole period from November 1982 (funds became available for the project with effect from November 1982) to May 1984 (18 months) as the preparatory phase of the project. The following activities were conducted during this period.

a. Recruitment and training of staff including village-level workers.
b. Selection of the field site.
c. Field preparations.
d. Development of a suitable infrastructure including the necessary laboratory facilities.
e. Development of a Sarvodaya organizational framework covering the project area capable of initiating community-based malaria control and surveillance.

The field operations began in a systematic fashion with effect from May 1984 which can be seen as the beginning of the exploratory phase of the project. Taking of blood smears by Sarvodaya workers began in 44 villages out of which 6 were used as tests and controls for exploratory source reduction interventions. The number of villages examined for specific source reduction interventions including control villages increased to 20 in December 1985. By December 1986 the number of project villages had increased to 60 and field operations had been continued in most of these project villages for nearly two and a half years.

The definitive phase anticipated in the revised plan of operations, however, was yet to be started as the necessary exploratory operations were in many ways still continuing in December 1986.

The key factors reponsible for the slow progress of project activities from 1982 to 1986 can be briefly stated as follows.

a. Rapid turnover of staff. For instance, up to December 1986 the Principal Investigators changed three times and the field coordinators changed no less than five times.

b. Lack of cooperation and at times direct confrontation between regular Sarvodaya workers and educationally qualified staff specially recruited for the malaria control project contributed to both rapid turnover of staff and other difficulties in the project.

c. Novelty of the idea, lack of prior experience in similar projects and non-availability of any model to follow.

d. Communal disturbances in the country and the resulting difficulties in organizing community actions and other field operations.

e. Operational difficulties in coordinating activities spread over a large number of villages.

3. Methods of Data Collection

All the data generated in a project other than the behavioural information were collected by trained Sarvodaya workers at the village level. The following surveillance operations have been carried out continuously by village-level Sarvodaya workers with assistance from other community members in relevant project villages mostly since 1984.

1. Parasite surveillance consisting of the following procedures:

   a. Fortnightly Fever Surveys covering all project villages. The relevant Sarvodaya worker contacts each household in her area twice a month and checks for fever cases. Blood smears are taken from those reporting fever and sent to the laboratory in the project office for examination for malaria parasites.

   b. Three monthly Mass Blood Surveys covering all project villages. These surveys cover children 1 - 10 years of age as they constitute a high risk group for malaria.

   c. Passive Case Detection covering the whole project area. Those with symptoms of malaria in between the above mentioned active case detection operations are encouraged to visit the relevant Sarvodaya worker in the village and obtain the recommended dosage of chloroquine. Blood smears from such patients too are sent to the laboratory for examination and the results communicated to the patients as quickly as possible.

2. Vector surveillance is done in selected test and control villages on a weekly basis. The vector is monitored at both larval and adult stages. The relevant Sarvodaya workers in each village identify and map potential vector breeding sites situated within a kilometer from the village center and search them for mosquito larvae once a week using a standard dipping instrument. The samples of adult mosquito are obtained weekly through human bite,

cattle bite and flit catch techniques. Both larvae and adult mosquito collections are sent to the project laboratory without delay for identification purposes.

3. Geographical Reconnaissance (GR) and Maintenance of Family Records. In each village project activities begin with a GR, i.e. a preliminary census of all households covering their composition, housing characteristics, possession of domestic animals and availability of peridomestic vector breeding sites. This is followed by a compilation of Family Records where all morbidity and all health-related events affecting all household members are entered every month by the relevant Sarvodaya workers at the village level.

It must be noted here that the above data collection procedures suffered from all the deficiencies associated with employing village-level workers to monitor health information. The relevant problems will be discussed in subsequent sections of the report. The development of this kind of data collection mechanism, however, is essential for the rational organization of a community-based system of malaria control.

According to the type of field operations carried out in them, the villages under the project can be classified into three categories.

1. Test Villages - villages where specific source reduction interventions are being carried out on an experimental basis. Within the project area there was a total of 12 test villages in December 1986.

2. Control Villages - each control village is matched with one or more test villages where specific interventions are carried out for the purpose of reducing vector densities. In both test and control villages both parasite and vector surveillance are carried out so as to evaluate the specific outcomes of the relevant interventions. The total number of control villages under the project in December 1986 was 8.

3. General Surveillance Villages - in these villages neither vector control interventions nor vector surveillance activities are introduced. Only parasite surveillance is carried out in the general surveillance villages. It is anticipated that when project activities expand in future suitable vector control measures will be introduced in general surveillance villages as well. In December 1986 the general surveillance villages in the project areas numbered 40.

The differences among project villages are further elaborated in Table 1.

Table 1: Classification of Project Villages

12 Test Villages Operations	8 Control Villages Operations	40 General Surveillance Village Operations
1. Normal AMC operations	1. Normal AMC operations	1. Normal AMC operations
2. Routine Sarvodaya work	2. Routine Sarvodaya work	2. Routine Sarvodaya work
3. Symptomatic treatment for malaria by Sarvodaya workers	3. Symptomatic treatment for malaria by Sarvodaya workers	3. Symptomatic treatment for malaria by Sarvodaya workers
4. Parasite surveillance by Sarvodaya workers	4. Parasite surveillance by Sarvodaya workers	4. Parasite surveillance by Sarvodaya workers
5. Vector surveillance by Sarvodaya workers	5. Vector surveillance by Sarvodaya workers	
6. Vector reduction interventions by Sarvodaya		

Thus activities 1 to 4 are common to all three types of project villages. Activity 5 is done in both test and control villages but not in other surveillance villages. Activity 6 is limited to test villages. The project has no control over normal AMC operations conducted in all project villages. However, it is possible to establish the vector control effects of SMCRP interventions in combination with the relevant AMC interventions as against the effects of the AMC interventions alone by comparing the test and control villages.

4. Behavioural Science Investigations

The relevant behavioural science investigations were carried out separately by sociology graduates working under the PI in each period. From July 1983 to December 1986 a total of 5 sociologists had worked full time in the project. None of these sociologists, however, was continuously employed in the project for more than one year. In the early period the sociologists did participant observation research in each of the project villages, staying in each village a period of 2 weeks at a time. Unfortunately much of the data generated through this process is presently not available in the project, as the persons concerned are believed to have taken away their reports and field notebooks when they left the project.

At present the project has two full-time sociologists serving in the project since September 1986. Under the guidance of the present PI, their efforts were concentrated on a limited number of villages so as to understand their history, social organization, cultural practices and views as related to malaria control and transmission and the role of Sarvodaya in these villages. They also conducted indepth interviews with Sarvodaya workers at the village level and other village leaders including various categories of indigenous medical practitioners. This report extensively utilizes the preliminary findings of these ethnographic investigations.

CHAPTER THREE

SETTING AND ORGANIZATION OF THE PROJECT

1. Socio-Economic Background of the Project Area

The project area is overwhelmingly rural. The provincial capital Anuradhapura is about 16 km north of the northern most point of the project area. The largest urban centre serving the area is Kekirawa town which lies just outside of the project area to its south. Only the southern most part of the project area is close to Kekirawa. The largest service centre within the project area is the Maradankadawala bazaar with a population of less than 1000. The main occupation in the area is farming which is largely subsistence oriented. However, in recent years chilli cultivation has emerged as an important cash crop in the area with Maradankadawala as an expanding marketing centre controlled largely by immigrant businessmen who collect agricultural produce from the surrounding villages.

The area is as yet sparsely populated relative to other parts of Sri Lanka. In 1986 it had an average population density of 219 people per square km. Often villages are separated from one another by a stretch of jungle. Most villages are relatively small. The average number of households per village in 1986 was 61, with a mean population size of about 300. In the whole area there is only one community with a population of over 1000. That too is a new settlement called Ethungama established recently (1985) for refugees from the East Coast.

1.1 Types of Communities in the Project Area

The local population is distributed in four types of community described below.

Table 2. Distribution of Population in the Project Area according to Type of Community, December 1986

Type of Community	No. of Communities	Total Population	Percentage of Total Population
Purana Village	44	14,143	80.7
Olagam	13	1,101	6.3
Bazaar	2	1,188	6.8
New Settlement	1	1,096	6.2
Total:	60	17,528	100.0

1. Purana Villages

A vast majority of the local people live in purana (ancient) villages. As the name indicates the inhabitants of purana villages consider themselves as native to the area. Each purana village has a long history dating back to at least several generations. Some villages have ruins from an ancient period (500 BC to 1000 AD), but the presence of such ruins does not necessarily indicate continuous human habitation in these communities from ancient times. As this native population has long been exposed to malaria it can be expected that it is highly adapted to the disease both in terms of immunity levels and cultural practices.

As a general rule all inhabitants in a purana village essentially belong to a single caste and are interrelated through kinship ties. Most villages in the area belong to the Goigama caste, the highest caste in Sinhalese society. There are also several low caste villages whose inhabitants were traditionally expected to serve and respect those in upper caste villages. Traditionally there was a strong community spirit within each village. As Leach (1961) illustrated in his study of Pul Eliya, traditionally the social life in a purana village centred around caste and kinship obligations which in turn were largely determined by cooperative use of water for agricultural purposes from a common tank.

An essential feature of a purana village is the presence of one or more tanks where rain water is collected for use in rice farming. The villagers have no records of when and how these reserviors were built, but normally they are many centuries old. It is likely that often the villagers themselves built these tanks through the mobilization of communal labour with minumum assistance or intervention from the State.

The village tanks are variable in size with bigger tanks normally found in larger villages with greater political significance. There is a common settlement pattern in each purana village with the local Buddhist temple, hamlets and rice fields situated at various elevations beneath the tank bund (see map 3).

Each purana village has evolved an intricate system of water management and a corresponding system of rice farming. In most villages rice farming is feasible only in one crop season of the year i.e. in the Maha season from September to March. When there is sufficient rain a secondary crop of paddy is reaped from May to August. In contrast to centrally managed irrigation systems such as the Mahaweli Development Programme, each purana village has considerable autonomy and control over how it manages its own water resources. This may mean that the inhabitants of purana villages are vulnerable to droughts, but through their long history they have evolved a fairly stable and adaptive social system where inequalities are not so sharp. During droughts when water levels in the tanks sink, the extent of paddy land each cultivator is permitted to cultivate is reduced proportional to the size of his land holding, so that a maximum number of farmers may benefit from the available stock of water. Such egalitarian principles were manifest in other aspects of social life in purana villages as well.

Apart from paddy cultivation the other important economic activity in purana villages is chena farming. The chenas or slash and burn plots in the surrounding jungle are cleared and cultivated, using primitive methods, mainly during the peak rainy season from September to March. The plots are abandoned from time to time so as to permit the restoration of fertility in the soil. Normally the chena land belongs to the Crown and the cultivators shift from one plot to another from time to time without squatting on a fixed plot of land permanently. The amount of land cultivated by each household as chena plots largely depend on the number of farm hands available within a household. On the average the size of chena plots range from 1 to 3 acres. The principal chena crops are corn, millet and other native species of grain such as meneri, udu, kollu, green gram, cowpea and vegetables. During the short rainy season from May to July sometimes a crop of gingili is grown. Traditionally chena crops were grown primarily for subsistence. But now chena produce is increasingly sold to middle men from outside. At present chilli is a very significant cash crop grown in Chena plots in the area.

Thus as a predominant and long established type of human community the purana villages have evolved customary ways of dealing with the harsh environment in the dry zone. While population movement in and out of the purana villages has been limited, a number of outside individuals and families have recently moved into some of these villages as government servants, encroachers, shop keepers and the like.

2. Olagam

In most instances an olagam is an extension of an existing purana village. When density of population in a purana village increases, some of the excess population move to a nearby area where there is an abandoned tank, renovate it through their own individual or collective effort, establish rice fields and thereby set up a new village around the renovated tank. An olagama is structurally similar to a purana village except for the fact that an olagama is usually smaller than a purana village. Often an olagama consists of less than 25 households. Usually the storage capacity of tanks in olagam is much smaller compared to those in purana villages with the result that much smaller number of families can earn their living in an olagama. To some extent those in an olagama depend on their original puranagama for some of the services like temples, services of native doctors, etc. However, as time goes on an olagama tends to become more independent in regard to such services. It is quite possible that over a long period of time as people enlarge their tank and as population increases the olagam themselves develop into purana villages.

3. Bazaar Communities

There is a total of three bazaar communities in and around the project area. They serve as service centres catering to the surrounding rural communities. Certain basic services such as post offices, police stations, schools, health outposts, private medical practitioners, and cooperative stores as well as various categories of traders are found in these bazaar communities. Each bazaar community has evolved from a puranagama, but the distinctive feature of a bazaar community is the presence of a large number of immigrants including people of low country origins and Muslims. In Maradankadawala there is also a considerable floating population such as middlemen who come and live in the town temporarily during harvesting of various crops such as chilli, paddy and green gram.

4. New Settlements

The project area has remained more or less insulated from large scale settlement programmes implemented by various government agencies. Two long established large scale colonization schemes and some of the more recently established Mahaweli settlements are situated some miles away from the project area. The Nachchiyaduwa colonization scheme, also fed by waters from Malwatu Oya (see map 2), is situated to the north-east of the project area. Another such scheme, Hurulu Oya project, exists a few miles east of the Yakalla town. Certain Mahaweli settlements under system H come close to the project area on its western side. However, none of these settlement programmes involving large scale movement of people from non-malarious areas into malaria-endemic regions, has up to now directly affected the project area in any significant way.

There is, however, one new settlement established within the project area in recent years largely as a refugee colony. Known as Ethungama this community is inhabited mainly by those who fled from Vavuniya and other places in the east coast due to terrorist activities in those areas. This community grew up rapidly since July 1985. Each settler family was given one and a half acres of high land and some assistance towards building their houses. Ethungama has neither a tank nor paddy fields. Nor is it possible for these new settlers of outside origin to get access to chena land in the nearby jungle. In effect, these new settlers in Ethungama, totalling about, 1000 do not have an assured means of earning a livelihood.

In sum, while the traditional purana villages continue to be the predominant type of rural community in the project area, emerging bazaars like Maradankadawala and newly established communities such as Ethungama indicate that changes are occurring slowly but steadily. As the influx of outside people, including migrants from non-malarious areas may increase in future, its possible implications for malaria control in the local area cannot be overlooked.

1.2 Facilities Relevant to the Project

The area in general is poorly served by government health facilities. There are government dispensaries at Maradankadawala, Pairamaduwa, Yakalla and Galkulama, each staffed by a Registered Medical Practitioner (RMP) or an Assistant Medical Practitioner (AMP). These institutions are primarily meant for out-patient treatment and are notorious for non-availability of essential drugs. Only two of these institutions have maternity wards. The nearest District Hospital in Kekirawa has 3 doctors and facilities for inpatient care. The General Hospital serving the entire province is in Anuradhapura. According to the information collected by the SMCRP, in over 50 percent of the villages, the nearest government medical service is 4 - 10 miles away. Given the non-availability of frequent bus services or any other means of transport accessible to most people, this is a considerable distance to travel, especially for those who are ill. The number of private medical practitioners providing western treatment within the project area is unknown. Often these are outsiders to the area and operate from nearby bazaars. In most instances, their qualifications and training are of a dubious nature. The role of traditional practitioners in the project villages will be discussed separately.

In regard to preventive health services the project area consists of four Public Health Inspector (PHI) Divisions which in turn come under two separate MOH Divisions. There are six Family Health Workers (FHW) engaged in PHC activities in the area, each covering a population of about 3500. The AMC operations in the area come under the Kekirawa Sub-Regional Office (SRO), serving a total population of approximately 85,000. The project area comes under five separate AMC spray units, each headed by a Field Assistant (FA). The project area however does not totally correspond with any of the administrative subdivisions under the AMC.

Map 2: The SMCRP Project Area with Subdivisions and Villages

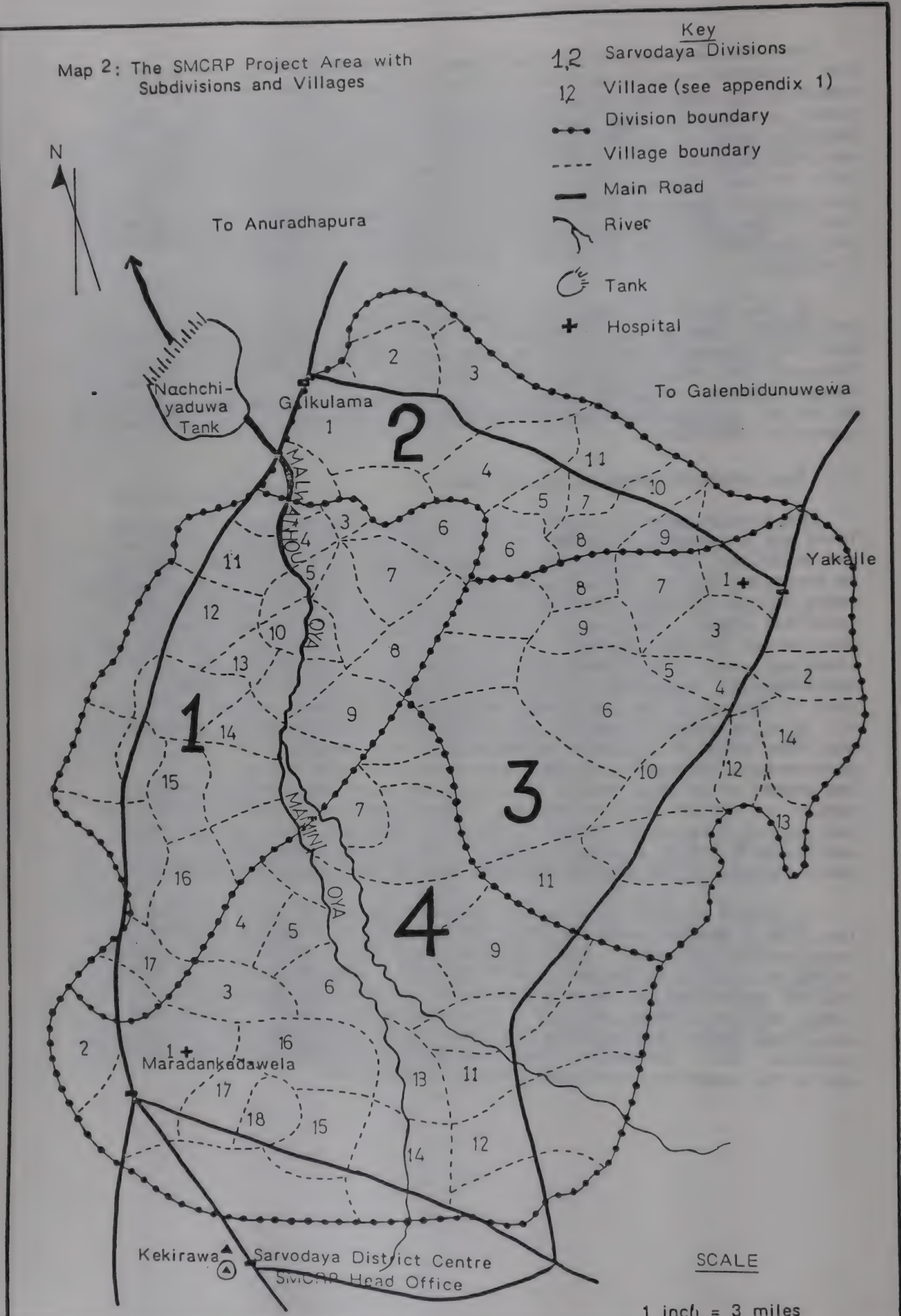
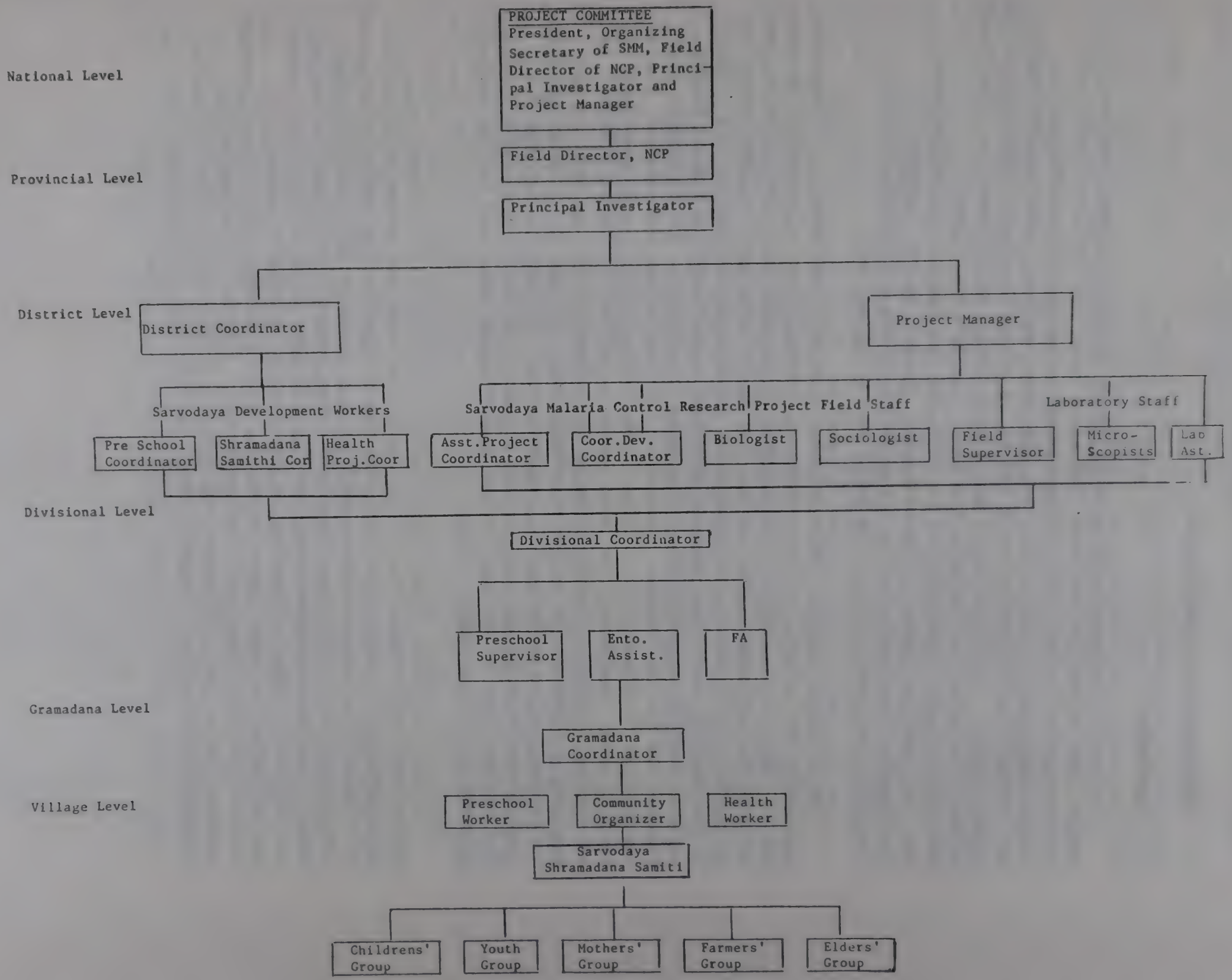


Figure 2: SMCRP Organizational Framework



As for the educational facilities the project area is served by four secondary schools and a total of 18 primary schools. A large number of school teachers are from outside the area. The adult literacy in the area is around 74% for males and 68% for females.

2. Organization of the Project

2.1 Background

The basic organizational problem faced by this project was how to evolve from within the relevant SSM structures the required technical competence for carrying out the necessary malaria containment and surveillance activities at the village level without damaging the spirit and strength of Sarvodaya which had to be accessible and acceptable to the local people. There was not a model that could be followed in this regard either from within or outside the SSM. The SSM itself was administratively decentralized in 1978 and the newly created Sarvodaya district administration in Anuradhapura, headed by the District Coordinator, was beginning to organize Sarvodaya activities in the district simultaneously as the SMCRP was being set up.

The original project administration was very sympathetic to Sarvodaya principles and ideas, but its technical capabilities in regard to malaria control were very limited. The technical capabilities within the project actually became established during the period from 1982 to 1984 under the leadership of Dr Ruberu, who was fully capable of developing all aspects of the project as he had equally thorough backgrounds in public health, malaria control and Sarvodaya programmes in general. He recruited and trained the Project Manager, Biologist, Entomological Assistants, Field Assistants, Microscopists, Village Level Workers etc., and developed through them a machinery for both parasite and vector surveillance. In developing technical capabilities of the project staff as well as in evolving procedures for malaria surveillance, he was, to a large extent, influenced by the existing AMC arrangements. Perhaps it was not a coincidence that during this period a number of senior positions within the project came to be held by retired AMC staff who were not necessarily sympathetic to Sarvodaya ideas.

As the technical capabilities within the project improved, an undesirable gap between the project and the local Sarvodaya organization also developed. While the local Sarvodaya organization was staffed mainly by committed Sarvodaya workers with strong roots in the local area and long experience in village level work, the project was being controlled mostly be outside professionals and technicians with little or no respect for Sarvodaya ideas. Compared to the regular Sarvodaya workers the project staff enjoyed higher salaries, better working conditions, greater control over vehicles and other resources. Further, the Sarvodaya approach is to help villagers overcome the problems that the villagers themselves identify. The SMCRP went against this rule of thumb by

invariably addressing the problem of malaria in all the villages it covered, and by trying to develop an alternative parallel structure right up to the village level staffed purely by salaried project personnel. However, it soon became clear that in order to mobilize the local communities effectively the active participation of the regular Sarvodaya workers at each level was necessary.

The regular Sarvodaya cadres were being newly established in the area with effect from 1983. This process received a new impetus when the Distruct Coordinator, Mr Harsha Navaratne, was promoted to Sarvodaya Field Director, following Dr Rubera's withdrawal from the project.

In December 1984 he divided the Anuradhapura District into two Sarvodaya administrative units, Anuradhapura West and Anuradhapura East, each headed by a separate District Coordinator. A highly devoted Sarvodaya worker, Soma Hurikaduwa, who had risen from below, was appointed as District Coordinator for Anuradhapura East inclusive of the project area. She had been with the project as a Divisional Coordinator since 1983. This highly dynamic female worker, contributed much towards building up the regular Sarvodaya institutions and programmes in the project villages with assistance from Navaratne above and many village level workers below. Many of the younger SMCRP staff too were given Sarvodaya training during this period so as to minimize ideological differences between the project staff and Sarvodaya workers. Just as many of the technical capabilities became established within the project through the interventions of Dr Ruberu and his team, the organizational capacity of the project became much strengthened due to the steps taken by Navaratne and Hurikaduwa. The latter left the project in June 1985 to take up the position of District Coordinator, Anuradhapura West.

2.2 Organizational Framework

The administrative and organizational structure given in figure 2 gradually evolved in the project since 1983. The project closesly follows the SSM organizational structure. In its administrative and spatial arrangements the project covers four of the eleven Divisions which make up the Sarvodaya District of Anuradhapura East which in turn is part of the Sarvodaya North Central Region. Each of the four Divisions in the project is divided into three Gramadana Units, each covering roughly about five villages.

The organizational framework of the project is presented in Figure 2. In addition to the regular Sarvodaya workers, the project involves specially trained malaria workers with specialized functions in malaria control. The main task of the regular Sarvodaya workers is to mobilize community action for malaria control when and where necessary. Most of the malaria workers under the SMCRP have been given both a required technical training and a training in Sarvodaya community work. In addition to carrying out specialized malaria control and surveillance functions, the Sarvodaya malaria workers take part in regular Sarvodaya activities such as family gatherings (Pawul humuwa) and make use of them

for educating the local people about malaria control. The regular Sarvodaya workers in turn are involved in organizing various community activities wherein malaria is addressed as a specific local problem.

The national level policy formulation with regard to project planning and ongoing review of project activities were done by the project committee, once a month in Sarvodaya Headquarters in Moratuwa. The project was implemented through the normal heirarchy of Sarvodaya workers assisted by specialized Sarvodaya malaria workers at each level.

The SSM perceives itself as an organization stemming from villages (see figure 2). In each village the SSM works through several specialized action groups, the representatives of each of which form a Shramadana Samithi, which is seen as the principal vehicle for Sarvodaya activities in each village. These community organizations are mobilized for various developmental, education, cultural and social welfare objectives by a heirarchy of Sarvodaya workers consisting of the Field Director (Provincial level), District Coordinator assisted by other relevant staff at the district level, Divisional Coordinator and pre-school supervisor operating at the divisional level, Gramadana Coordinator who is in charge of a cluster of 5 villages and three categories of village level workers who are working closely with the village level organizations.

The village level workers are often local youths with 8 to 10 years of formal education. Among them there is a majority of females. While the pre-school worker who runs a preschool in collaboration with the local Mothers' Group is by definition a female, the health workers are nearly always females. The health worker, who has received PHC training, provides first level of treatment for commonly prevalent ailments in a village. Both pre-school and health workers are given a basic training followed by continuous refresher training through training camps held in Sarvodaya centres at national, provincial and district levels. The position of Community Organizer (Gami Sanvidayaka) was specially created within the SMCRP as a village level post with responsibilities for malaria control. Unlike the pre-school worker* and health worker who are un-paid volunteers, the Community Organizers are paid a modest monthly allowance of Rs. 180 to Rs. 250, in view of their special responsibilities in the project. While pre-school and health workers are part timers, the Community Organizer (CO) is a full-time worker with specific responsibilities (described later) assigned by the project. In most project villages one and the same person serves as the pre-school cum health worker.

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* The pre-school workers too were paid a monthly allowance by the SSM up to April 1986. Subsequently this allowance was discontinued expecting the respective local communities to bear the relevant costs.

The higher level Sarvodaya workers, who receive a regular monthly allowance depending on their experience and rank, are often those risen from among the village level workers. The Sarvodaya workers at higher level receive additional training in Sarvodaya philosophy community development, planning and implementation of projects, financial management, etc.

The SMCRP gave rise to the creation of a specialized malaria control staff with necessary technical capabilities primarily at the District and Divisional levels. Led by the Project Manager, who in turn is guided by the PI, the specialized malaria control staff consists of 4 Entomological Assistants, 1 Field Supervisor, 4 Field Assistants, 2 Sociologists, 1 Biologist, 2 Microscopists and several other office and auxillary staff associated with the project head office and the accompanying laboratory. The primary job of this specialized malaria control staff is to carry out continuous parasite and vector surveillance in the project villages in collaboration with the relevant Sarvodaya workers at Divisional, Gramadana and village levels who in turn are helped in these operations by Childrens´ Groups and Youth Groups in the respective villages. The results of the surveillance operations are immediately transmitted back to the relevant local communities which in turn carry out suitable vector control measures, when necessary, under the guidance of the project staff.

2.3 Organization of Field Operations

The SSM/SMCRP activities carried out in project villages are as follows:

1. Regular Sarvodaya Programmes being implemented in selected project villages. They include pre-schools, health centres, nutritional programmes, construction of wells and toilets, agricultural extension, supply of credit facilities, marketing and various other services.

2. Parasite surveillance through PCD, fortnightly Fever Surveys and three monthly MBS in all project villages.

3. Provision of first level of treatment for all fever patients with symptoms of malaria in all project villages.

4. Vector surveillance through identification of vector breeding sites and continuous weekly collection of larvae and adult mosquitoes from relevant sites in selected project villages.

5. Experimentation with certain selected simple vector control methods in a limited number of project villages.

6. The development of a household level information system for monitoring PHC activities in selected project villages.

These different activities are mainly conducted by Sarvodaya workers at the village level. The coodination of such activities, the training of VLWs for carrying out the necessary tasks and the supervision of their work are done by Sarvodaya workers at higher levels. In each village the malaria related activities are organized and carried out mainly by the CO with assistance from the health worker, pre-school worker and other community members. The tasks of the CO include identification and mapping of all potential vector breeding sites in a village, taking of a village census, weekly checking of local water bodies for mosquito larvae, provision of relevant anti-malarial drugs and the necessary advice regarding how to use them to the local people with symptoms of malaria and the taking of blood smears from the relevant individuals. The COs are trained for these tasks by the higher level Sarvodaya malaria workers with assistance from local AMC staff from time to time.

All the malaria control and other Sarvodaya activities within a gramadana unit covering about five villages are supervised and coordinated by a gramadana worker. Often the gramadana workers are those with previous experience as COs. At the divisional level, the coordination and supervision of all activities related to parasite surveillance including the collection of blood smears from COs, delivering them to the laboratory and transmitting laboratory results back to the relevant villages are done by the Field Assistant (FA) assigned to each Division. The parallel responsibilities in relation to vector surveillance are held by the Entomological Assistant (EA) in each Division. The FAs and EAs are responsible for training of COs in the relevant aspects of malaria control. Almost all the FAs and EAs have received some training from the AMC. The pre-school supervisor in each Division supervises the various pre-schools in the Division and organizes the training of pre-school workers. The Divisional level coordination of normal Sarvodaya activities and malaria control operations is done by the Divisional Coordinator who is normally a very experienced Sarvodaya worker. The field operations throughout the project area in relation to parasite surveillance are supervised by the Field Supervisor. The vector surveillance and control throughout the project area are in charge of the Senior Entomological Assistant, who together with the Biologist, also supervise laboratory work carried out in the project head office. The District Coordinator is responsible to the Field Director for all Sarvodaya activities within the District inclusive of the project area. The overall administraiton of the project and the supervision of all Sarvodaya activities within the project area are in charge of the Project Manager who too is directly responsible to the Field Director who is finally responsible to the SSM and various funding agencies supporting the SMCRP.

In December 1986 the SMCRP staff consisted of 171 workers including volunteers. Their distribution is given in Table 3.

Table 3: Distribution of SMCRP Staff by Category and Sex, 1986

Category	Sex		Total
	Male	Female	
1. Office, Lab. & Supervisory staff	12	5	17
2. Divisional Coordinators	4	0	4
3. Entomoligcal Assistants	3	0	3
4. Field Assistants	3	1	4
5. Pre-school Supervisors	0	4	4
6. Gramadana Coordinators	4	8	12
7. Pre-school workers	0	43	43
8. Health Workers (where different from pre-school worker)	0	13	13
9. Community Organizers	2	5	71
	47	124	171

Thus a majority of SMCRP workers are women. All pre-school supervisors, pre-school workers and health workers are women. Even among the Community Organizers an overwhelming majority are women. The predominance of women among the Sarvodaya workers at the village level may be due to lack of alternative employment opportunities for women in rural areas. It may also be due to the fact that child care and health care normally come under the domain of women in rural Sri Lanka. The presence of more females among the SMCRP field staff guaranteed a high degree of female participation in its activities at the village level.

2.4 The Community Organizers: Background and Issues

As the COs are the key malaria workers employed in this project, it is important to explore their background and role somewhat further. The first batch of COs consisting of 35 persons was recruited and trained in May 1983. They were selected from among a total of 60 youths who attended a Shramadana camp held in one of the project villages. The youths from various villages in the area were invited for this Shramadana camp by, a Public Health Inspector in the area who happened to be an active supporter of Sarvodaya and a leading person involved in the preparatory stage of the SMCRP. He spread the news about the Shramadana camp among the local youths through his various contacts in the area. Following the Sarvodaya tradition, the more active among those who attended the work camp were selected for training as COs. Later they were given a six weeks' training in the Anuradhapura Sarvodaya Centre covering basic malariology and principles of Sarvodaya work at village level. After their training they returned to their respective villages with instructions to collect basic demographic information from each village. At the outset each CO had to work in two or more villages usually in their home area. Later as the project activities increased the number of COs increased too. By 1986 there was at least one CO in each of the designated project villages. Since 1985 the selection of village level workers was mainly done by the Divisional Coordinator in charge of each area from among the local youths active in Sarvodaya work. They are given the necessary training by the senior SMCRP staff with the help of local AMC staff.

As of September 1986 the majority (40 out of 55) of the COs were females. All of them were in the 18-39 age group. Over 80% of the COs had GCE (OL) or higher qualifications. About 67% of the COs had served in the project for less than two years. It is well known that the rapid turnover of trained workers can pose a serious problem in community based health programmes. Data concerning the length of service of the COs currently in service indicate only 20 percent of them were with the project since its inception. In December 1986 only 7 out of the original batch of 35 Community organizers remained in the project as COs. Another 8 of them had received promotions as Microscopists etc., within the project. Thus a total of 20 out of the original batch of 35 COs had left the project within a period of about three and a half years. This gives a dropout rate of 57% for the entire period of three and half years and an annual dropout rate of about 16%. This very high dropout rate, given the many uncertainties that had faced the project at various stages, is not surprising.

Table 4: Reasons for leaving the project

Reason	Number	%
Personal	8	40
Marriage	5	25
Government Employment	5	25
Higher Education	1	5
Death	1	5
	20	100

2.5 Comparison with the AMC

Finally a number of organizational differences between the AMC and SMCRP can be noted.

First, the SMCRP has at least one malaria control and surveillance agent in each of the project villages. In contrast, the lowest administrative unit within the AMC is a FA unit which normally covers about 20 villages. The AMC cadre does not include any village level workers.*

Second, the SMCRP workers at village, Gramadana and Divisional levels are usually those from the local communities themselves. Even though they are paid workers, they are expected to work towards relieving the malaria problem in their own areas with the help of their fellow community members including their neighbours, friends, kinsmen etc. In contrast, the AMC workers are often outsiders to the area. Often their families live in other parts of Sri Lanka. Their work is limited to 8 hours a day and that too involves numerous bureaucratic procedures. On the other hand, the local population consisting mostly of the inhabitants of purana villages is not used to working closely with outside government agencies.

Third, the SMCRP exists as a component of a larger community development programme with broad socio-economic goals. The SMCRP workers at each level work as a part of a team seeking to improve the living conditions and the morale of the local people. The local AMC staff on the other hand by and large have no relation to any other programmes addressing the needs of the local people.

Fourth, certain categories of AMC field staff directly in contact with the public consist exclusively of men, i.e. PHIs, FAs, Spraymen. In contrast, the SMCRP field staff consists of both males and females with a numerical predominance of the latter.

Finally, the AMC approach involves the employment of a limited number of workers with high technical skills and higher salaries so that they may implement a centrally administered disease control programme in a well coordinated manner. On the other hand the SMCRP approach involves the use of a large number of workers with required minimum technical skills and modest salaries, so that they may carry out simple surveillance measures and simple control operations at the required level of intensity usually within their own localities and with the active participation of the local people. Each approach has its advantages and disadvantages in trying to achieve various malaria control objectives.

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* The AMC successfully mobilized the services of volunteers in parts of Sri Lanka including certain new settlements under the Mahaweli scheme from 1977 to 1983. This programme, however, has weakened since then. For details see Silva 1986.

CHAPTER FOUR

Malaria Surveillance and Control at the Village Level

At the primary objective of this project was to institute an appropriate malaria control mechanism and a corresponding surveillance system at the village level to be sustained through community participation, this chapter will examine the progress achieved by the project in regard to this objective. Both the progress made and difficulties encountered in these activities over a period of two and a half years are reviewed.

1. Malaria Surveillance

There are two outstanding differences between the surveillance system anticipated in the SMCRP and that instituted under conventional malaria control programmes. First, the aim of malaria surveillance under the conventional malaria eradication strategy is to detect who has which type of malaria for the purpose of treatment and evaluation of centrally administered interventions. The information generated through this process moves upwards so as to facilitate a centrally administered intervention programme (Ruberu 1985a, 1985b). In contrast, the aim of surveillance under the SMCRP is to help villagers understand how much malaria there is in their own community and to what extent and in what ways its local transmission can be contained through their own action. Ideally, such surveillance should be carried out as far as possible by the local people themselves with required assistance from outside. In essence the surveillance under SMCRP is an exercise in community diagnosis wherein the community itself becomes aware of the magnitude of a local health problem and discovers its capabilities and strengths in addressing it.

Second, the main surveillance operation under the conventional malaria control strategy is the search for parasitologically positive cases. This is a legacy from malaria eradication. Further, the parasites appear only after transmission has taken place. On the other hand the SMCRP's goal is to develop a method of forecasting impending epidemic outbreaks so that timely action can be taken by the relevant local communities with required assistance from the outside to avoid or minimize the impact of such epidemic outbreaks (Wyon 1982). Such a surveillance system must pay much attention to the surveillance of the vector, so that communities can immediately detect any unusual build-up of vector densities within their own localities (Ruberu 1985c). The communities may also be kept informed about any ecological and sociological processes occurring in the local areas that may contribute to malaria epidemics.

Since the beginning of 1986, 20 out of the total of 60 villages under the project have been covered by a broad range of surveillance activities including vector, parasite and epidemiological surveillance. In each village the necessary surveillance activities are carried out by trained COs with help from other community members and under the supervision of the FA and EA stationed in each Division. When this designated surveillance agent is not available in a village or unable to do a

relevant task due to illness etc., such tasks may be done by another Sarvodaya worker at the village level i.e., health worker or pre-school worker. However, as will be elaborated later, the considerable turnover of village level workers noted earlier has affected the quality of surveillance in some of the villages.

The surveillance system developed under the SMCRP involves the following procedures.

1.1 Reconnaissance Activities

In each village under intensive surveillance, operations begin with three kinds of reconnaissance activities. First, the CO and his/her helpers in each village go around the village, identify all potential vector breeding sites situated within half a mile from the village centre, and mark them in a village map. Second he/she takes a census of all households in the village using Geographical Reconnaissance forms. Third, basic health information in respect of each household is entered in the Family Record designed as a tool for broad epidemiological surveillance.

1.2 Weekly Larval Examination

All water bodies present within the defined village area must be checked weekly for the presence of mosquitoe larvae. This is done by the local CO with the help of school children who are often members of Sarvodaya Organizations, i.e. Childrens´ Group or Youth Group.

The larvae collected from each water body are counted and classified according to genera and stages by the CO. The relevant information together with information about the nature and size of the relevant breeding sites are entered in the Larval Collection Forms. The collection of larvae and accompanying forms are then sent to the project laboratory for microscopic examination. The collection of larvae from each village and their species identification using the microscope are done by the EA responsible for each Division.

1.3 Weekly Adult Mosquito Examination

Mosquito bite tests using humans and cattle are conducted weekly in each of the 20 villages under intensive surveillance. In a few selected villages adult mosquitoes resting inside a suitable human dwelling are collected through the flit catch technique. All the adult mosquito tests are conducted at night usually in places close to the Community Organizer´s home and wherever possible under the direct supervision of the local EA. At the Monthly Service Meetings attended by all COs in a Division the EA prepares monthly schedules for larval collections and adult mosquito tests in the relevant villages. In each village larval collection is done on a pre-arranged date during the day time and the adult mosquito tests are conducted during the night that follows. In this way the EA can focus his attention on one village at a time. The adult mosquito collections too are taken to the laboratory by the EA for species and sex identification.

1.4 Fever Surveys and Mass Blood Surveys

The CO in each village has been instructed to visit each house in the village once a fortnight and inquire about incidence of fever since his/her last visit. A blood smear is taken from anyone reporting fever. The blood smears collected this way are sent to the laboratory for microscopic examination through the local FA or any other project person visiting the village. The microscopic examination of blood films is done by two specially trained microscopists who were selected from among the experienced COs. The results are communicated back to the village for necessary action usually through the FA. Where a Plasmodium falciparum (P.f.) case is detected a person from the project head office immediately visits the village and advises the relevant patient to seek hospital treatment. The project staff has been advised to inform the local AMC office of any P.f. cases detected within the project area.

A Mass Blood Survey (MBS) covering all children aged 1 - 10 years is conducted in a village once in three months usually in the months of March, June, September and December. It too is carried out by the CO under the guidance and supervision of the local FA. As the volume of blood smears collected increases during the MBS months, additional persons with required skills from among the field staff are deployed in the laboratory during these months for checking and processing them. Most of the COs have also been given a basic training in the use of the microscope. From time to time samples of blood smears from the SMCRP are sent to the AMC laboratory at Anuradhapura for cross checking the results. The margin of error detected up to now through this procedure has been negligible.

1.5 Epidemiological Surveillance

The Family Records has been developed as a mechanism for broad epidemiological surveillance. Each household in a village has a Family Record maintained by the local CO. It gives a continuous record of all pregnancies, births, illness episodes and deaths in a household. A separate form is used to obtain the relevant information from each of the children under 6 years of age, married women, males over 18 years of age and all other individuals in a household. The forms for these four different groups are printed in different colours so as to facilitate the entry of relevant information. Each household is visited once a month by the CO in order to update information in the Family Record.

2. The Results

Only some of the surveillance procedures noted in the previous sections have been successfully carried out in the various villages. The COs, the main surveillance agents in a village, have found it difficult to cope with some of the requirements. For example, the Family Records have not been correctly and continuously maintained in most villages rendering it impossible to analyze the relevant data. As will be seen several problems are encountered in trying to interpret the entomological and parasitological data generated so far within the SMCRP. However, a fair degree of success has been achieved in regard to vector surveillance

carried out in a limited number of villages. The communities have taken considerable interest in knowing where the mosquitoes breed and why they breed in such large numbers in certain months of the year. School children in particular have become active agents of vector surveillance. Over the years the COs have gained increased competence in larval collection, adult mosquito tests, identification of mosquitoes and in understanding where mosquitoes breed. It has been found that larval collection is much easier to carry out than adult mosquito tests where direct supervision by the EA often becomes necessary.

The water surfaces under continuous surveillance for A. culicifacies larvae in the relevant project villages are listed in Table 5.

Table 5: Typical Water Surfaces in Project Villages and their Association with Vector Breeding

Type of Water Surface	Permanent or Temporary	Level of A.C. Breeding	Peak Vector Breeding Months
1. Tanks	Permanent	Medium to low	1. July-August 2. March-April
2. Rivers and natural streams	Permanent	Medium	1. July-August
3. Irrigation canals	Temporary	Medium	1. November-January 2. May-June
4. Seepage sites near tanks	Temporary	High	1. October-December
5. Rice fields	Temporary	High	1. October-November
6. Surface pools created after the rains	Temporary	High	1. October-January 2. May
7. Rock pools	Temporary	Low	1. October-January
8. Tree holes	Temporary	Nil	--------
9. Wells currently in use	Permanent	Low to Nil	All months
10. Abandoned wells	Permanent	Nil	--------
11. Seepage sites near wells	Permanent	High	All months
12. Man-made pits	Temporary	Medium	1. October-January 2. May
13. Hoof prints	Temporary	High	1. October-January 2. May
14. Drains	Temporary	Low	1. February-March 2. May-June
15. Coconut shells tins, tyres etc.	Temporary	Nil	--------

As noted in earlier chapters tanks, rice fields and irrigation canals are essential features of purana villages in the area. Normally tanks are too deep for A.culicifacies breeding, but it has been found that under certain circumstances A.c. does breed at moderate levels on tank edges during certain times of the year. However the peak period of vector breeding in the tanks is in the dry months from July to August when water levels in the tanks sink and there is pool formation on tank beds. As the dry season progresses, however, these water pools become too polluted for A.c. breeding. The irrigation canals distribute water from tanks to rice fields and occasionally from one tank to another. Due to silting there is pool formation conducive to A.c. breeding in these canals mostly from November to January and from May to June following the peak water supply from the tanks for agricultural purposes. In rice fields water remains long enough for A.c. larvae to develop only from October to November and in May following the transplanting of paddy in each season. Although some effort was made to keep under surveillance A.c. breeding in rice fields at the beginning of the SMCRP, this effort has not been followed up since the first biologist attached to the project, left. Another reason for poor attention to rice fields has been that they often fall outside of the defined village area covered by intensive vector surveillance.

In most villages there are places where seepage water from the tanks is collected in ways that are conducive to A.c. breeding. Often such seepage sites are found immediately below the tank bund near the main sluices of the tank. These seepage sites are usually created during the peak rainy season from October to December when the tanks fill up with water. The rivers and natural streams in the area also become effective vector breeding sites especially during dry months when there is pool formation on river and stream beds. Here too the pools become too polluted for A.c. breeding as the dry season progresses.

Perhaps the most important single factor affecting both the level of vector breeding and extent of malaria transmission in the area is the temporary water pools in close proximity to human settlements which form during the peak rainy season from October to January and to a lesser extent in May. During the peak rainy season the whole area becomes a sea of pools. These pools are ideal for A.c. breeding as they are shallow, clear, fairly stagnant, sufficiently exposed to sunlight and surrounded by vegetation. The rock pools and water filled tree holes, also created in the same months, were found to be less significant for A.c. breeding.

Wells are the main source of drinking water in the project villages. There are also numerous abandoned wells. It has been found that normally there is no A.c. breeding in abandoned wells probably because they are too polluted for A.c. breeding. Some A.c. larvae have been detected in wells currently in use. However, the extent of vector breeding in these wells may be limited due to the effect of constant bailing out of water from such wells. Nevertheless A.c. larvae have been detected in considerable numbers in seepage sites near wells including the recently-constructed tube wells in several project villages. Due to poor drainage, water is often collected arounds wells creating conditions suitable for vector breeding.

In the local villages there are a few types of man-made pits where water is collected during the rainy seasons. Around the dwelling units (especially newly built ones) there are borrow pits used for taking soil for home construction. During droughts holes are dug up on tank beds for obtaining water for various purposes. Finally there are pits used for setting traps for wild animals. Hoof prints of the animals are often found near water sources like tanks and wells. There are patches of stagnant water along the drains usually in months immediately after the rainy season. The project staff have detected A.c. larvae in varying densities in all these water bodies. The preliminary investigations have revealed that coconut shells, tins and other containers found in most compounds are not important in respect of A.c. breeding.

A number of general points emerge from vector surveillance carried out by the project up to now. First, out of the 15 types of water surfaces under surveillance for the vector, 9 are to some extent man-made. Almost all of them are amenable to community intervention. Second, different types of water bodies are important for A.c. breeding in different months of the year. The peak period of A.c. breeding in the area is during the N.E. monsoon from September to January. But there can be increased vector breeding during droughts too, due to formation of pools along river beds, canal beds etc. Third, the importance of different types of water surfaces vary in different villages. For instance, both the size and number of tanks vary in different villages. In effect, different vector control strategies may be needed for different villages.

The results of parasite surveillance will be reviewed when discussing the effects of vector control interventions.

3. Experiments in Vector Control

Up to December 1986 the SMCRP has experimented with 3 methods of vector control in a total of 20 villages covered by intensive surveillance under the project. While 12 of these villages serve as test villages under different vector control interventions, another 8 villages are used as controls. Each test village was matched with a control village in respect of the number, size and type of vector breeding sites. Each control village is separated from the relevant test village by a reasonable distance and a jungle of some sort.

The methods of vector control used in these experiments are as follows:

1. Elimination of vector breeding sites through draining or earthing of unnecessary water bodies, using sharamadana labour.

2. Introduction of ´Nalahandaya´ (Aplocheilus davi), an indigenous species of fish with proven larvivorous tendencies in suitable water bodies in the relevant villages.

3. Application of monoxci, a non toxic larvicidal agent designed to suffocate the larvae by creating a monomolecular film on water, in appropriate permanent water bodies in chosen villages.

The first and third methods have been in use in selected villages since July 1984. The second method was first introduced in February 1986. The background, rationale and method of implementation of each vector control method used in SMCRP are described in the next sections.

3.1 The Shramadana Method

The utilization of the shramadana method of labour mobilization as a means of vector control shows the distinctive impact of Sarvodaya ideas on the project. In this project the shramadana (donation of labour) is used to mobilize the large volume of human labour required for elimination of all unnecessary vector breeding sites in a village within a relatively short time. Filling of unnecessary puddles, pits, abandoned wells etc., with soil, clearing, widening or desilting of canals, drains, streams etc., for the purpose of preventing stagnation of water and repairing of tank bunds for the purpose of preventing seepage of irrigation water are among the vector control operations normally carried out. The relevant activities are organized by Sarvodaya workers at the village level in partnership with the local Shramadana Samithiya (for details see Silva and Wyon, 1986). Normally the whole community gathers in a shramadana and this creates an ideal environment for educating the community about malaria transmision and control. From the experience gained so far it appears that the shramadana approach is acceptable to the local people. One operational difficulty, however, is that the peak demand for shramadana labour clashes with that for agriculture, as both occur simultaneously after the rains. Moreover, the high incidence of malaria in the relevant season also constitutes an obstacle to the mobilization of communal labour for vector control. On the average a total of 3 - 4 shramadanas were held per year in a relevant test village.

3.2 The Use of Larvivorous Fish

This method is especially useful for larval control in tanks, drinking water wells and certain types of water pools which can not be dealt with under the shramadana method. The original supplies of Nalahandaya were obtained from natural sources situated about 65km away from the project area. After searching the local streams for one day the project staff secured the first catch of ´Nalayandaya´ using a net. They discovered that many fish died during their transportation from Puttalam to Anuradhapura East. Later they began to breed the relevant species of fish in fish tanks constructed in one of the project villages. Now it produces enough fish for distribution in the 2 relevant test villages. The breeding of fish and their distribution are done by a specially trained EA with help from other persons. The releasing of fish in local water bodies and the subsequent checking of their presence in water are done by the COs with the assistance of the Youth Group. The fish are initially released mainly in the tanks, assuming that from the tanks they will also spread to other vector breeding places including rice fields. The tanks are periodically replenished with the fish so as to maintain sufficient numbers of fish in a tank throughout the year. Further experimentation with this and other species of larvivorous fish has been prevented up to now due to the non-availability of a suitably qualified biologist on the project staff.

3.3 The Application of Monoxci

This method was introduced to the project in collaboration with a group at Southampton University which developed monoxci. Visiting scientists from Southampton University directly supervised and guided the application of monoxci in experimental trials in selected project villages. After the initial field trials the early formulation of monoxci was combined with BTI so as to enhance its larvicidal effect. Monoxci and its improved version, MBTI or MONTI were considered especially suitable for tanks and large water pools which are not amenable to other methods of control. The products were designed in such a way that it was both safe and feasible for the community members, including children, to apply them in the relevant water bodies at monthly intervals. The products were supplied free of charge to the project. The necessary compounds were prepared in the project head office and distributed to the village through the COs who in turn used the services of local children for their application in local water bodies. The products however were not received with equal enthusiasm in all the villages where they were introduced. In some communities people expressed concern over their environmental effects including the effect on fish, cattle and people using the relevant water bodies. A few Sarvodaya workers themselves raised questions about monoxci at monthly staff meetings etc. This showed the difficulties involved in the use of an exogenous product as a tool in community-based vector control. The AMC also expressed concern over the use of monoxci in a community setting. In response to these various concerns trials using monoxci were terminated in December 1986. The future use of monoxci within the project will be decided by the Project Committee in the near future.

4. The Results of Vector Control Interventions

The result of the three vector control interventions carried out separately in selected project villages, as evident from the surveillance data generated by the project are summarized in Table 12. The data for a total of 6 villages consisting of one test and one control village relevant to each intervention are presented in Tables 6 to 11*. In Table 12 the number of anopheline and A.c. larvae detected per metre of pool edge surveyed, the number of adult anophelines and adult A.c. collected chrough the standard tests together with the API per 1000 population are used to assess the impact of the interventions used. For shramadana and monoxci villages, data are available from 1984 to 1986. As the fish programme was introduced in 1986, the relevant data are available only for 1986.

The comparison between Dambagollewa and Puliyankulama serving as test and control for shramadana method respectively shows that the densities of both all anopheline larvae and A.c. larvae are higher for the control

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* The data analysis for all test and control villages is not yet complete

village compared to the test village for all years other than 1984 when, contrary to the expected pattern, there is a higher density of all anopheline larvae in the test village. In regard to adult mosquito counts, compared to the test village there is a higher anopheline and AC count in the control village in 1985 and 1986. Here, as in the case of the density of all anopheline larvae the pattern is reversed in 1984. There is no consistent variation between the two villages in regard to API. In summary, even though the results are not entirely consistent it does appear that there is a gradual reduction in vector density following shramadana interventions.

As regards the results of the larvivorous fish programme, the differences between the test and control villages are quite marked (see Table 12). As expected, the density of both all anopheline and A.c. larvae are considerably higher for the control village compared to the test village. The pattern is repeated as regards the adult vector. Finally the API for the control village is much higher than that for the test village.

The results of monoxci tests are somewhat confusing. As expected the density of all anopheline larvae was higher in the control village relative to the test village in 1984 and 1985. However, the pattern was reversed in 1986. Moreover, contrary to the expected pattern the test village recorded a consistently higher density of A.c. larvae relative to the control village in all 3 years. As for the adult mosquito count while the number of all anophelines found was consistently higher in the control village relative to the test village, the opposite was true in respect of the adult A.c. count. Finally, in both years for which data is available, the test village recorded a consistently and significantly lower malaria incidence compared to the control village in conformity with the pattern expected.

This is as far as we can go with the available data. The results so far are not very conclusive, but on the basis of the available results we may conclude that each intervention is worth pursuing further. Of the three interventions the fish programme has produced the most consistent results up to now. There is scope for developing various combinations of the three interventions in the same village as each intervention may be particularly suited to certain types of breeding sites. Certain other innovative vector control strategies too need to be considered and developed for application in the relevant project villages. The possibility of using cattle as a means of diverting the vector away from human hosts, for example, needs to be explored further. Preliminary data analysis presented in Chapter 5 shows that there may be a relationship between the size of the cattle population and the frequency of malaria infections in the local villages. Such an approach may also suggest avenues for linking malaria control with developmental efforts such as the promotion of animal husbandry.

5. Further Description of the Data

The monthly variation in rainfall*, pool edge, larval count, adult mosquito count, and the number of malaria cases detected through FS and MBS in each of the 6 villages, covering the period from 1984 to 1986 are given in Tables 6 to 11. There is a broad correspondence among rainfall, pool edge, larval and adult mosquito counts and the number of malaria cases in each village. This is to say that the extent of rainfall determines the extent of pool edge which in turn determines the number of anopheline larvae and adult anophelines which then affects the number of malaria cases in each village. In almost all the villages peak malaria incidence is from November to December, corresponding with the rainfall pattern.

We must be rather cautious in interpreting the parasitological data reported in Tables 6 to 11. According to the reporting system used by the SMCRP from its inception, it is not possible to separate the result of Passive Case Detection (PCD) and Fewer Surveys (FS) or PCD and MBS. For some months it is based on a combination PCD and FS,for other months it is based on a combination of PCD and MBS, the latter covering only the 1 to 10 age group. Thus we must bear in mind that the reported monthly variation in malaria incidence may be partly due to the variation in the method of surveillance used in each month.

Moreover, there are many gaps and inconsistencies in the data, particularly in the case of parasitological data. In most villages MBS do not appear to have been conducted in a consistent manner. For instance in Dambagollewa (see Table 6), no MBS was done in September 1985 or in March and June 1986. The MBS results for September 1986 are also of dubious nature since only 5 blood films were taken in the MBS. In the corresponding months there are many gaps in the data relating to other variables, suggesting an overall poor surveillance in the relevant months.

Similar problems are repeated in the other villages for which data are available. On the basis of the available data the viability of conducting three monthly MBS may be questioned. The failure to conduct the MBS in some of the relevant months and the poor number of blood smears taken at certain MBS may also be due to poor public cooperation for repeated MBSs. On the whole the data suggest that with the properly trained village level workers vector surveillance is far more feasible than parasite surveillance. Instead of taking MBS every three months, they could be conducted only when fever surveys and vector surveillance suggest the possibility of an unusual increase of malaria transmission in a given village.

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* For the purpose of present analysis, the average monthly rainfall for the Anuradhapura District as reported by the Meteorology Department is treated as an approximation of the average monthly rainfall of the villages studied.

To sum up, it can be said that while a useful beginning has been made, there is considerable scope for refining the surveillance and vector control procedures currently in use in the project and their methods of implementation. On the whole the existing surveillance procedures may be too complex, too cumbersome and far too demanding for the village level workers to carry out. While the progress achieved in respect of broad epidemiological surveillance using Family Records has been negligible, fair progress has been made in parasite surveillance and notable progress in regard to community-based vector surveillance. It follows that the existing procedures for broad epidemiological and parasite surveillance must be simplified further and made more amenable to community diagnosis and detection of early signs of impending malaria epidemics. In regard to the vector control methods used, they too must be developed further with a view to determining the appropriate mix of source reduction and source control methods suitable for each situation. The methods for reducing man-vector contact as a means of reducing malaria transmission in the local area are yet to be developed through the project.

Table 6: Surveillance Data for Dambagollewa from 1984 - 1986 Shramadana Test

Year & Month	Rainfall mm	Pool edge in metres	Larvae 3 & 4 stages All An.	Larvae 3 & 4 stages A.C	Adult Vector All An.	Adult Vector A.C	Parasitology FS + PCD BF	FS + PCD PV	FS + PCD PF	MBS + PCD BF	MBS + PCD PV	MBS + PCD PF
1984												
Aug.	NA	28	572	6	11	1	5	3	0	--	--	--
Sept.	NA	24	0	0	2	0	-	-	-	21	1	0
Oct.	NA	10	0	0	0	0	9	3	0	--	--	--
Nov.	NA	29	129	2	13	0	6	4	0	--	--	--
Dec.	NA	91	303	23	35	11	--	--	--	28	4	0
		182	1004	31	61	12	20	10	0	49	5	0
1985												
Jan.	132.3	177	417	6	9	8	13	3	0	--	--	--
Feb.	68.9	79	147	13	20	2	7	4	0	--	--	--
Mar.	114.0	68	200	10	10	4	--	--	--	25	1	0
Apr.	87.4	68	71	9	6	0	14	4	0	--	--	--
May	159.0	43	0	0	2	0	10	1	0	--	--	--
June	9.7	20	0	0	1	0	--	--	--	25	1	0
July	79.0	Dry	0	0	0	0	3	0	0	--	--	--
Aug.	65.3	Dry	0	0	0	0	0	0	0	--	--	--
Sept.	119.0	Dry	0	0	0	0	-	-	-	NA	NA	NA
Oct.	48.4	37	5	0	0	0	0	0	0	--	--	--
Nov.	355.6	68	165	0	7	1	0	0	0	--	--	--
Dec.	180.5	36	174	8	16	2	-	-	-	34	--	0
	1419.1	596	1179	46	71	17	47	12	0	84	5	0
1986												
Jan.	208.5	40	22	2	7	1	0	0	0	--	--	--
Feb.	17.2	16	89	1	1	0	0	0	0	--	--	--
Mar.	148.7	12	109	2	10	0	--	--	--	NA	NA	NA
Apr.	122.7	12	98	3	16	0	NA	NA	NA	--	--	--
May	116.3	12	54	1	0	0	NA	NA	NA	--	--	--
June	0	Dry	0	0	0	0	--	--	--	NA	NA	NA
July	0.8	Dry	0	0	0	0	3	0	0	--	--	--
Aug.	10.1	Dry	0	0	0	0	32	5	0	--	--	--
Sept.	22.3	Dry	0	0	0	0	-	-	-	5	2	0
Oct.	239.5	88	53	0	5	0	0	0	0	--	--	--
Nov.	112.1	132	341	9	41	5	7	5	0	--	--	--
Dec.	114.1	110	314	13	54	9	--	--	--	68	12	0
	1112.3	422	1080	31	144	15	42	10	0	73	14	0

Table 7: Surveillance Data for Pulivankulama from 1984 - 1986
Shramadama Control

Year & Month	Rainfall mm	Pool edge in metres	Larvae 3 & 4 stages All An.	Larvae 3 & 4 stages A.C	Adult Vector All An.	Adult Vector A.C	Parasitology BF	Parasitology PV	Parasitology PF	Parasitology BF	Parasitology PV	Parasitology PF
1984												
Aug.	NA	33	275	17	10	0	15	4	0	--	--	--
Sept.	NA	40	140	10	5	0	--	--	--	21	3	0
Oct.	NA	40	95	2	0	1	4	2	0	--	--	--
Nov.	NA	4	98	29	42	0	5	2	0	--	--	--
Dec.	NA	44	76	11	0	0	--	--	--	30	6	1
		161	684	69	57	1	24	8	--	51	9	1
1985												
Jan.	132.3	54	175	6	19	4	11	2	0	--	--	--
Feb.	68.9	102	194	13	35	9	8	5	0	--	--	--
Mar.	114.0	44	119	10	49	7	--	--	--	22	3	0
Apr.	87.4	62	220	9	0	0	3	0	0	--	--	--
May	159.3	73	156	7	0	0	7	1	0	--	--	--
June	9.7	36	18	1	0	0	16	0	0	NA	NA	NA
July	79.0	20	58	1	4	0	9	1	0	--	--	--
Aug.	65.3	56	53	1	8	0	4	0	0	--	--	--
Sept.	119.0	40	45	1	0	0	--	--	--	NA	NA	NA
Oct.	48.4	24	28	0	1	0	2	1	0	--	--	--
Nov.	355.6	25	45	0	14	2	6	2	0	--	--	--
Dec.	180.5	46	129	12	20	3	--	--	--	21	5	0
	1419.1	383	1250	61	150	25	66	12	0	43	8	0
1986												
Jan.	208.5	30	461	2	48	5	1	0	0	--	--	--
Feb.	17.2	42	481	10	38	4	9	2	0	--	--	--
Mar.	148.7	28	226	13	31	5	--	--	--	NA	NA	NA
Apr.	122.7	40	270	4	27	5	4	2	0	--	--	--
May	116.3	64	130	6	29	4	4	1	0	--	--	--
June	0.0	23	85	3	12	2	--	--	--	NA	NA	NA
July	0.8	12	0	0	1	1	2	1	0	--	--	--
Aug.	10.1	15	0	0	1	0	7	1	0	--	--	--
Sept.	22.3	16	0	0	0	0	--	--	--	3	1	0
Oct.	239.5	Dry	0	0	0	0	2	1	0	--	--	--
Nov.	112.1	230	658	19	50	9	8	5	0	--	--	--
Dec.	114.1	228	576	23	59	13	--	--	--	56	19	0
	1112.3	728	2887	80	296	48	37	13	0	59	20	0

Table 8: Surveillance Data for Maminiyawa, 1986
Fish-test

Year & Month	Rainfall mm	Pool edge in metres	Larvae 3 & 4 stages All An.	Larvae 3 & 4 stages A.C	Adult Vector All An.	Adult Vector A.C	Parasitology FC & PCD BF	FC & PCD PV	FC & PCD PF	MBS + PCD BF	MBS + PCD PV	MBS + PCD PF
1986												
Jan.	208.5	--	--	--	--	--	--	--	--	--	--	--
Feb.	17.2	232	620	0	3	0	1	0	0	--	--	--
Mar.	148.7	198	12	0	4	0	--	--	--	NA	NA	NA
Apr.	122.7	196	4	0	2	0	1	0	0	--	--	--
May	116.3	168	5	0	4	0	1	1	0	--	--	--
June	0.0	152	3	0	0	0	--	--	--	31	6	0
July	0.8	140	1	0	0	0	0	0	0	--	--	--
Aug.	10.1	120	21	1	10	0	0	0	0	--	--	--
Seot.,	22.3	Dry	0	0	0	0	--	--	--	NA	NA	NA
Oct.	239.5	412	0	0	0	0	0	0	0	--	--	--
Nov.	112.1	100	28	0	6	1	2	2	0	--	--	--
Dec.	114.1	110	19	2	9	2	--	--	--	52	11	0
	1112.3	1828	712	3	38	3	5	3	0	83	17	0

Table 9: Surveillance Data for Pahala Ambatale, 1986
Fish-Control

Year & Month	Rainfall mm	Pool edge in metres	Larvae 3 & 4 stages All An.	Larvae 3 & 4 stages A.C	Adult Vector All An.	Adult Vector A.C	Parasitology FC & PCD BF	FC & PCD PV	FC & PCD PF	MBS + PCD BF	MBS + PCD PV	MBS + PCD PF
1986												
Jan.	208.5	--	--	--	--	--	--	--	--	--	--	--
Feb.	17.2	413	1173	4	31	1	11	4	0	--	--	--
Mar.	148.7	400	1160	3	4	2	--	--	--	8	3	0
Apr.	122.7	36	102	10	4	1	7	5	0	--	--	--
May	116.3	48	15	1	1	3	3	1	0	--	--	--
June	0.0	10	8	0	0	0	--	--	--	51	5	0
July	0.8	5	10	3	0	0	4	3	0	--	--	--
Aug.	10.1	13	0	0	1	0	1	1	0	--	--	--
Sept.	22.3	7	5	0	0	0	--	--	--	1	1	0
Oct.	239.5	12	10	1	5	0	2	1	0	--	--	--
Nov.	112.1	87	12	1	7	1	15	11	0	--	--	--
Dec.	114.1	96	17	1	3	0	--	--	--	67	21	0
	1112.3	1127	2512	24	56	8	42	26	0	127	30	0

Table 10: Surveillance Data for Kattamurichchana from 1984 to 1986
Monoxci-Test

Year & Month	Rainfall mm	Pool edge in metres	Larvae 3 & 4 stages All An.	Larvae 3 & 4 stages A.C	Adult Vector All An.	Adult Vector A.C	Parasitology 15-day BF	15-day PV	15-day PF	MBS + PCD BF	MBS + PCD PV	MBS + PCD PF
1984												
Aug.	NA	57	308	15	26	2	3	2	0	--	--	--
Sept.	NA	120	505	51	18	1	--	--	--	48	17	0
Oct.	NA	57	118	0	0	0	4	2	0	--	--	--
Nov.	NA	19	123	0	3	0	5	2	0	--	--	--
Dec.	NA	51	279	0	14	2	--	--	--	40	8	0
		304	1333	66	61	5	12	6	0	88	25	0
1985												
Jan.	132.3	260	254	0	3	1	18	4	0	--	--	--
Feb.	68.9	132	152	0	3	1	2	0	0	--	--	--
Mar.	114.0	101	158	0	13	0	--	--	--	28	2	0
Apr.	87.4	73	148	0	6	1	2	1	0	--	--	--
May	159.3	60	90	0	8	1	0	0	0	--	--	--
June	9.7	105	119	22	2	0	--	--	--	15	1	0
July	79.0	31	30	10	2	0	10	2	0	--	--	--
Aug.	65.3	31	45	12	6	0	1	1	0	--	--	--
Sept.	119.0	52	0	14	0	1	--	--	--	14	5	0
Oct.	48.4	31	45	0	2	0	10	1	0	--	--	--
Nov.	355.6	23	41	0	7	3	4	0	0	--	--	--
Dec.	180.5	Dry	0	0	0	0	--	--	--	21	9	0
	1419.1	899	1082	58	52	8	47	9	0	78	17	0
1986												
Jan.	208.5	Dry	0	0	0	0	7	3	0	--	--	--
Feb.	17.2	72	115	3	22	5	4	1	0	--	--	--
Mar.	148.7	48	58	1	5	0	--	--	--	1	1	0
Apr.	122.7	54	85	0	6	1	16	1	0	--	--	--
May	116.3	38	67	0	2	0	1	1	0	--	--	--
June	0.0	42	70	4	2	0	--	--	--	85	2	0
July	0.8	57	60	2	2	1	6	2	0	--	--	--
Aug.	10.1	35	123	4	2	1	0	0	0	--	--	--
Sept.	22.3	60	60	5	1	1	--	--	--	2	2	0
Oct.	39.5	44	67	5	2	1	0	0	0	--	--	--
Nov.	112.1	59	58	6	4	1	17	7	0	--	--	--
Dec.	114.1	82	78	3	3	1	--	--	--	73	20	1
	1112.3	591	841	33	51	12	51	15	0	161	25	0

Table 11: Surveillance Data for Patis Rambewa from 1984 to 1986
Monoxci-Control

Year & Month	Rainfall mm	Pool edge in metres	Larvae 3 & 4 stages All An.	Larvae 3 & 4 stages A.C	Adult Vector All An.	Adult Vector A.C	Parasitology AS+PCD BF	AS+PCD PV	AS+PCD PF	MBS + PCD BF	MBS + PCD PV	MBS + PCD PF
1984												
Aug.	NA	6	9	0	9	1	0	0	0	--	--	--
Sept.	NA	16	29	0	0	0	--	--	--	19	2	0
Oct.	NA	19	53	0	10	0	6	2	0	--	--	--
Nov.	NA	55	94	1	51	0	0	0	0	--	--	--
Dec.	NA	62	750	5	19	0	--	--	--	82	14	0
		158	935	6	89	1	6	2	0	101	16	0
1985												
Jan.	132.3	190	298	0	15	0	6	2	0	--	--	--
Feb.	68.9	93	129	0	11	0	0	0	0	--	--	--
Mar.	114.0	62	116	0	64	0	--	--	--	50	4	0
Apr.	87.4	32	31	2	48	0	0	0	0	--	--	--
May	159.0	45	62	3	18	0	0	0	0	--	--	--
June	9.7	35	35	0	5	0	--	--	--	6	2	0
July	79.0	24	14	0	3	1	1	0	0	--	--	--
Aug.	65.3	34	43	0	1	1	0	0	0	--	--	--
Sept.	119.0	22	4	0	20	5	--	--	--	NA	NA	NA
Oct.	48.4	33	27	2	1	0	--	--	--	--	--	--
Nov.	355.6	14	33	0	7	0	11	2	0	--	--	--
Dec.	180.5	Dry	0	0	0	0	--	--	--	63	12	0
	1491.1	584	792	7	193	7	8	4	0	11	18	0
1986												
Jan.	208.5	64	0	0	0	0	15	8	0	--	--	--
Feb.	17.2	107	203	0	21	4	16	4	0	--	--	--
Mar.	148.7	82	208	0	33	2	--	--	--	6	2	0
Apr.	122.7	49	71	0	13	0	0	0	0	--	--	--
May	116.3	35	20	0	8	0	12	5	0	--	--	--
June	0.0	32	69	0	2	0	--	--	--	78	7	0
July	0.8	42	22	0	2	0	0	0	0	--	--	--
Aug.	10.1	47	12	1	2	0	5	2	0	--	--	--
Sept.	22.3	6	0	0	2	0	--	--	--	20	12	0
Oct.	239.5	40	9	0	0	0	0	0	0	--	--	--
Nov.	112.1	48	15	2	3	1	16	12	0	--	--	--
Dec.	114.1	64	24	1	12	3	--	--	--	79	10	0
	1112.3	616	644	4	98	10	64	31	0	183	31	0

Table 12. Summary Results of Vector Control Interventions in 6 Project Villages

NAME OF VILLAGE	DENSITY OF MOSQUITO LARVAE FOR POOL EDGE METRE						ADULT MOSQUITO COUNT						API		
	All Anophelines			A.C.			All Anophelines			A.C.					
	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
Shramadana															
Test - Dambagollawa	5.5	2.0	2.6	0.17	0.08	0.07	61	71	144	12	17	18	-	56.7	70.6
Control - Puliankulama	4.2	2.1	4.0	0.43	0.10	0.11	57	150	296	7	25	48	-	43.3	71.4
Fish															
Test - Maminiyawa	-	-	0.39	-	-	0.00	-	-	38	-	-	3	-	-	28.9
Control - Pahala Ambatale	-	-	2.23	-	-	0.02	-	-	56	-	-	8	-	-	195.1
Monoxci															
Test - Kattamurichchana	4.4	1.2	1.4	0.22	0.06	0.06	61	52	51	5	8	12	-	115.5	154.7
Control - Patis Rambewa	5.9	1.4	1.1	0.04	0.01	0.01	89	192	88	1	7	10	-	187.5	364.7

CHAPTER FIVE

Socio-Cultural Responses to Endemic Malaria

In this chapter we examine the folk beliefs and practices, traditional healing methods and remedies, and other behavioural factors related to malaria control and transmission in the local area. Much of the information reported here was collected by the sociologists attached to the project through continuous field visits to the villages, direct observation of certain traditional practices and interviews with relevant key informants in the area. A systematic survey of local people's knowledge, attitudes and practices relating to malaria, however, has not yet been undertaken.

1. The Folk Concept of Malaria

Malaria has been a leading cause of morbidity and mortality in the Anuradhapura District, formerly known as Nuwarakalaviya, throughout its known history. Robert Knox, who lived in Sri Lanka from 1660 to 1679, wrote in his travelogue that 'agues and fevers' were a main hazard to the visitors to Nawarakalaviya at that time and thought it was caused by the drinking of filthy venomous water (Knox 1681: 154). The subsequent colonial literature made frequent references to fever of Nuwarakalaviya (e.g. Brodie 1858). The term 'malarial fever' is frequently encountered in colonial documents from 1860 (Ondatjie 1861). In 1899 Ivers reported malarial fever as the 'disease par excellence of the North Central Province' (1899: 100).

Although the term 'malaria' was used in colonial documents from 1860 or so, it was translated into a widespread folk category (maleriyawa) in Nurwarakalaviya much later, probably during the great epidemic of 1934/35. Often the local folk tradition does not recognize a connection between malaria and any of the pre-existing illness categories. Some local practioners claimed that malaria was newly introduced to the area along with DDT!

However, the local folk tradition recognized several febrile conditions some of which are listed below.

Local Term	Literal Meaning
1. Unahembirissawa	Fever and cold
2. Unakahihembissawa	Fever, cough and cold
3. Gahena Una	Shivering fever
4. Mura Una	The fever that recurs at fixed intervals
5. Kala Una	Jungle fever
6. Unasannipatha	Fever caused by upsetting of three humours
7. Sanniya	Chill, coma
8. Kolegaya	Distressful chest infection
9. Walippuwa	Fits

As is usually the case with folk illness categories (Nichter 1979), often the above categories do not correspond precisely with any Western disease categories as defined today. Of the different conditions listed above, unahembirissawa was considered least serious and walippuwa the most serious. It was generally held that if not treated properly less serious of these conditions would deteriorate into more serious ones. Hence these conditions were not seen as mutually exclusive. Most probably conditions 1 and 2 referred to different states of common cold.

In Nuwarakalaviya the terms gahena una, mura una and kala una were used more or less synonymously and it appears likely that mostly, if not exclusively, they referred to malarial conditions. It is significant that fever (una) is mentioned in all three terms. As accompanying terms gahena una refers to shivering and mura una refers to periodicity of fever. The term Kala una (jungkle fever) implies that the relevant disease is contracted while in the jungle doing chena cultivation, hunting, logging etc.

Of the other febrile conditions identified in the local folk tradition, unasannipataya was considered an acute condition caused by the simultaneous upsetting of all three humours. Sanni-kola-walippu in turn were seen as further complications arising from unasannipataya. In addition to acute fever, physiological and mental derangements of a specific nature such as deliriums, fits, coma etc., were commonly attributed to sanni-kola-walippu. Some indigenous medical texts mention 18 types of sanni, 18 types of kola and 18 types of walippu giving this illness complex an omnibus character (Department of Ayurveda 1984). It is possible that several unrelated Western diseases such as pneumonia, typhoid, encephalitis or even acute cases of falciparum malaria were included within the sanni-kola-walippu complex.

The local people clearly recognized that every year there occurred a seasonal rise in the incidence of fever. Further, it was perceived that the fever season was typically associated with certain cyclical changes in the environment. The people used to say ´fever breaks out when the flowers of the thora plant begin to appear´. This ubiquitous local plant (cassia tora) flowered annually following the onset of NE monsoon rains which, as we know now, heralds the peak season of malaria transmission in the endemic dry zone. Whether or not the thora plant was implicated in any prevailing folk etiology of the disease is not clear from the available evidence.

In the local folk symptomology agues were seen as an important concomitant of malaria fever. A folk phrase widely used to describe the relevant symptoms was ´shivering and vibrating like the coconut flower´ (polmala wage sat a sata gala gahenawa). The analogy of the coconut flower possibly referred to the rhythmic whipping of one´s forehead with a freshly opened coconut flower and the accompanying bodily movement by a dancer at some local healing rituals as a sign of being possessed. Thus the folk perception of the disease was much influenced by environmental and cultural markers relating to the local area.

As far as we can determine the scholarly ayurveda ideas have not affected the beliefs and practices relating to malaria in Nuwarakalaviya to any significant extent. With the exception of a few learned ayurvedic practitioners, none of the local inhabitants were familiar with the ayurveda terminology commonly applied to malaria, namely visamajwara (intermittent fever) and santatajwara (remittent fever) and the corresponding treatments. There is no evidence that the relevant ayurvedic ideas were used widely in the diagnosis and treatment of any of the locally prevalent disease conditions. However, the belief and practices relating to the locally prevalent sanni-kola-walippu illness complex are said to have been influenced by the popular siddha tradition of South Indian origin (Department of Ayurveda 1984).

2. Folk Remedies for Malaria

A basic home remedy widely used in Nuwarakalaviya as a first level of treatment for unahembirissawa was a preparation made from ginger and coriander (ingurukottamalli). More serious febrile conditions including malaria fevers were locally treated with a specific herbal preparation called pastel tambuma (lit. brew made from five types of oil). This preparation in fact was made by adding four types of vegetable oil and one type of animal oil to a brew made from five types of local herbs as given below.

Oils	Herbs
1. Kohomba tel (oil extracted from the seeds of the plant Azadirachta indica)	Yakinaran leaves (Atlantia ceylancia)
2. Tal a Tel (Oil extracted from the seeds of the plant Sesamum indica)	Lime Leave (Citrus aurantifolia)
3. Mee tel (Oil extracted from the seeds of the plant Medhuca longifolia)	Roots and tender leaves of ginger
4. Enderu tel (Oil extracted from the seeds of the plant Ricinus communis)	Kuppameniya leaves (Acalypha indica)
5. Gitel (Ghee or clarified butter)	Pavatta leaves (Adhatoda vasica)

Its method of preparation consisted of pounding of all five herbs together in a mortar, steam-boiling of the preparation so made using an indigenous device (vanduwa), squeezing of essences (swarasaya) and finally adding to it the required quantitites of the five types of oils. This preparation was consumed two or three times a day together with one of the local sweetners, bee honey or jaggery.

It being a popular home remedy, the ingredients of pastel tambuma and its method of preparation were widely known among the local peasants. One important feature of this preparation was that all its ingredients were

readily available and indigenous to the area. All of the five herbs used were to be found in one's own home garden or its immediate surroundings. Four of the oils used were extracted from the seeds of commonly found local plants. Of these sesame was (and still is) an important food crop grown in the local chenas. Moreover, the technique of extracting oils from the relevant seeds, using a locally made wooden crusher and an accompanying mat container (paha), had been known in this area for generations. As raising of cattle too is an important ingredient of the rural economy of Nuwarakalaviya, ghee is also readily available. Finally, of the sweeteners used with pastel tambuma, bee honey was readily collected from the local jungle in some months of the year.

On the whole pastel tambuma preparation was firmly rooted in the local ethnopharmacopia. In contrast to dococtions (Kashaya) in ayurveda which also contain numerous exotic substances like dried grapes, dates etc., the preparations belonging to the indigenous herbal tradition mostly utilized locally available substances.

It is important to consider whether there was any conception of a disease vector among the local people. None of the locally prevalent diseases was directly or indirectly attributed to mosquitoes. There was however, a curious local belief which held that there was a marked proliferation of mosquitoes due to the flowering of the thora plant since it was held that the mosquitoes actually bred in the pollen of the flower. Given the association between peak rainfall season and flowering of the thora plant noted earlier, the perceived peak in mosquito breeding corresponds to reality. The local peasants, however, saw no relationship whatsoever between proliferation of mosquitoes and the annual outbreak of fever despite the fact that they considered both events to be associated with the annual flowering of the thora plant. Thus they had correctly identified the peak season of both mosquito breeding and fever incidence, even though they did not perceive any relationship between the two.

Even though the mosquito was not seen as a disease vector, the local peasants consider it a major nuisance. In some folk poetry (palkavi) the bite of the mosquitoes is equated with life threatenting dangers from certain wild animals. Hence, in Nurwarakalaviya, as in the rest of Sri Lanka, there has been a long-established practice of burning certain local herbs as a method for driving away mosquitoes from homes and temporary watch huts in chenas at night. Some local plants like maduru tala (lit. mosquito plant = Ocimum sanitum) were widely known for their mosquito-repellent qualities. Using a discarded earthenware vessel, one or more of the substances like madura tala, kohomba leaves, pangiri (pangiri grass), Kohomba muru (plant matter left over from the process extracting oil from the seeds of Azadirachta indica), meemuru (leftover from the process of extracting oil from the seeds of Maduca longifolia), cashewnut husks etc., were burnt all night in many local homes. In order to facilitate and prolong the smoke, coconut or paddy husks, placed at the bottom of the vessel were burnt along with the herbs. The smoke which normally started at dusk continued till dawn of the following day with herbal and other ingredients being added from time to time. It is likely that this smoke helped to protect the local people against the mosquitoes

vectors during critical times of the night. Unlike other aspects of ethnopharmacopia, the practice of using smoke as a mosquito repellent continues to be important in purana villages in Anuradhapura District.

As in pastel tambuma, the ingredients used in mosquito repellent smokes were all essentially indigenous to the area. For the most part they were waste products like coconut or paddy husks and kohomba or mee muru. It is also interesting to note that to some extent different products of the same locally available herbs (e.g. kohamba tel and kohomba muru; mee tel and mee muru) were used in herbal medication for 'malaria' on the one hand and as mosquito repellents on the other. This shows that while the local peasants did not recognize any connection between fevers and mosquitoes, at the practical level there was some degree of integration between folk medication for malaria and the devices used locally for mosquito control.

Finally we may consider ritual practices related to malaria. It does not appear that locally malarial conditions came under the purview of any elaborate healing rituals. However, with the onset of any fever two relatively insignificant ritual acts, namely applying of chanted oil (tel matirima) and tying of a chanted thread around one's neck (nul badima) were usually performed. Both these practices were seen as protective rather than curative devices as those with any physiological ailments like fever were thought to be specially vulnerable to demonic attacks. In sum, malaria was perceived and dealt with largely through a localized secular herbal tradition.

3. The Role of Traditional Practitioners

The traditional practitioners constitute a very important category of health care providers in this area. While the western medical institutions are often too far away from the villages, there is hardly any village without one or more traditional practitioners. Indeed they are an important category of village leaders in the local area. The distribution of various types of practitioners in local villages is shown in Table 13.

Table 13: Types of Practititoners Distributed in 47 Project Villages, 1984

Types	Number	Per cent
Ayurvedic Physicians	28	16.2
Herbal Physicians	47	27.2
Snake bites specialists	24	13.9
Bone setters	22	12.7
Western practitioners	02	1.1
Exorcists	42	24.3
Others	08	4.6
Total:	173	100.0

The largest category of traditional practitioners in the area are herbalists followed by exorcists and ayurvedic physicians. There are also considerable numbers of snake-bite and bone specialists. Of the various kinds of local practitioners only herbalists continue to treat malaria using purely indigenous herbal medicines. They use a variety of herbal preparations made from secret formulae handed down from the past. The Western practioners as well as some of the local ayurvedics mainly use Western antimalarials in the treatment of malaria. Some tend to use a mixture of Western and indigenous medications. Over the past 50 years or so the local people have by and large switched to Western medicine for malaria treatment, but their confidence in the efficacy of Western antimalarials has considerably decreased in more recent years.

4. Migration and Economic Activities

Until recent times human migration has not been an important factor affecting the level of malaria transmission within the project area. However, in December 1985 a malaria epidemic of considerable proportion broke out in a refugee colony, Ethungama, accommodating about 300 Sinhalese families which had fled from terrorist attacks along the east coast. As noted elsewhere (Silva & Wyon, 1986), the malaria epidemic in Ethungama confirmed the assumption that while the local people are by and large protected against prevailing levels of malaria transmission in the area, the same level of malaria transmission can lead to an epidemic situation among migrants from a non-malarious or less malarious background. Further, in trying to overcome the malaria epidemic in Ethungama, the SMCRP adopted an integrated vector control strategy involving an intensive and simultaneous application of all three vector control measures developed so far by the project. It demonstrated the ability of SMCRP to mobilize community action for reducing the vector densities in the local area drastically, as an effective emergency measure for controlling an epidemic.

The principal economic activities in the area are rice and chena farming. The connections between these economic activities and levels and patterns of malaria transmission in the area are yet to be satisfactorily understood. Up to now, both rice fields and chena farms have been largely excluded from vector surveillance under the SMCRP as the relevant operations cover only a one km radius from the village centre. However, chena cultivation, in particular, appears to be much related to levels of malaria transmission. The chena cultivation season corresponds with the peak rainy season which, in turn, corresponds with the annual peak vector breeding. During the relevant months the chena farmers often spend their nights in temporary watch huts erected in the chena plots and thus become highly exposed to the vector in its peak breeding season. Moreover the regular malaria control measures such as spraying of malathion do not appear to be implemented thoroughly in the chenas due to their poor accessibility and temporary and unauthorized nature. On the whole this points out the need to pay greater attention to the local economic activities in future malaria control research in the area.

How cattle rearing, an important economic activity in the rural economy of the dry zone, affects the level of malaria transmission in the local area is examined here by using GR information and parasitological findings for 47 villages covered by the project. The resulting data are presented in Table 14.

Table 14: Distribution of 47 Project Villages according to number of Cattle and API, 1986

	API per 1000 Population						
Number of Cattle per Village	Below 25	25-49	50-74	75-99	100-150	>150	Total
0 - 10	1	2	1	3	1	6	14
11 - 20	2	0	0	0	0	2	4
21 - 40	0	1	0	1	1	1	4
41 - 60	1	2	2	0	0	2	7
>60	8	2	5	2	1	0	18
Total	12	7	8	6	3	11	47

The data show that on the whole there is an inverse relationship between the number of cattle in a village and its API determined through parasite surveillance under the project. While cattle may also contribute to vector breeding by creating hoof prints etc., it appears that their role in deflecting the vectors away from human hosts is more important in determining the level of malaria transmission in the local villages. How far cattle may be used to form a 'cattle barrier' protecting the human communities against the local vectors during their peak biting times must be determined through future research under the SMCRP.

Table 15 shows that males have a slightly higher malaria incidence than females in the project area. This may be due to local practices such as the watching of chenas at night by males, the frequent use of verandahs and other open spaces for sleeping by adult males, and the wearing of less clothes by men compared to women. These ideas however must be empirically tested and refined through future research.

Table 15: Distribution of all Microscopically Positive Malaria Cases in the SMCRP Project Area by Sex, 1986

Sex	Number	%
Male	1009	51.2
Female	960	48.8
Total:	1969	100.0

In sum, the local peasants traditionally perceived malaria as one of several related conditions characterized by repeated attacks of fever and fits. There was a clear conception of both periodicity and seasonality of the disease. The remedies consisted mainly of certain herbal medications using locally available plant matter. Over the years the inhabitants had developed certain adaptive practices which, apparently, had the effect of minimizing their exposure to the disease, i.e. mosquito-repellent smokes and cattle rearing. The efficacy and possible operational use of such practices in a PHC approach to malaria control deserve attention.

CHAPTER SIX

Community Development Efforts and Achievements

In this project malaria control was included as a component of a larger development programme. The results of the project as related to the larger goal of community development are examined in the present chapter.

It is important to note that in the project area the Sarvodaya programmes developed largely in conjunction with the establishment of community-based malaria control efforts. Prior to the beginning of the SMCRP, Sarvodaya activities had begun only in a few selected local villages. In most instances, Sarvodaya ideas and programmes were introduced to the local communities through the SMCRP. The necessary infrastructure too was built largely through SMCRP funds. Only in 1986 separate funds became available for some of the regular Sarvodaya activities in the area.

The Sarvodaya activities other than malaria control can be broadly classified as follows:

1. Institution building.
2. Shramadana camps.
3. Cooperative economic activities.
4. Educational and cultural programmes.
5. Training of workers, community leaders and others.
6. Health and sanitation.

Those villages where at least one of the above activities are being carried out successfully with active participation of the community have been classsified as active villages. As of December 1986 there was a total of 60 active villages comprising 76.9 percent of all villages in the area. In each village the relevant activities are organized by village level workers assisted by volunteers. The average number of workers and volunteers per village is about 3. The Divisional Coordinator in charge of each Division is responsbile for promotion and coordination of various Sarvodaya programmes within his or her administrative division. The progress achieved in respect of each activity is discussed below.

1. Sarvodaya Activities in the Project Area

1.1 Institution Building

Some of the key Sarvodaya institutions like Childrens' Group, Youth Group, Mothers' Groups and Shramadana Sarmithi have been established in most of the project villages. Farmers' Groups and Elders' Groups are less significant in the area. Apart from the Shramadana Samithi, every other group is a peer or interest group seeking to promote cooperative action within the relevant segment of the village population. The aim of

Shramadana Samithi is to promote community-wide cooperation in various matters within each village. The Shramadana Samithi is a registered body having the necessary legal powers to undertake village development activities.

The pre-school too is a key Sarvodaya institution whereby an effort is made to inculcate desired social values in children at an early age. Formerly the pre-school workers were paid a regular monthly allowance by the SSM. This allowance was terminated in April 1986, and, as a result, the number of pre-schools in the area decreased considerably. Although the training of pre-school workers is still done by Sarvodaya, the existing pre-schools are maintained largely by the local Mothers Groups. This can be cited as a good example of a programme initiated by the SSM which has now become a self-supporting venture managed by the local people.

In addition to the regular Sarvodaya institutions, health committees have been established in many project villages to promote community participation in health activities. However, up to now this organization has played only a limited role in the area.

1.2 The Shramadana Camps

A total of 128 shramadana camps were held in various project villages during 1986. As noted earlier, programmes based on donation of labour by community members is a key activity under the SSM. A detailed breakdown of the work done in various shramadana camps in the project villages is not available. Cutting of roads, construction of required public buildings (e.g. pre-school buildings), repairing of irrigation works, and the elimination of vector breeding sites through communal labour are among the principal tasks accomplished through these camps.

1.3. Cooperative Economic Activities

There are two cooperative farms, one community shop, several model home gardens and some savings and credit schemes managed by various Sarvodayua institutions in different project villages. Both cooperative farms and home gardens are being developed as models suited to the local area. Much effort is made to develop both appropriate farming techniques and suitable managerial systems. The Childrens´ Fairs, which are quite popular in the area, are designed to promote the habit of saving among the children. The children are encouraged to open savings accounts with the money earned from selling their domestic products. In a number of villages there are Sarvodaya programmes for providing credit to farmers and other small scale producers on easy terms. The non-repayment of loans by some of the borrowers, however, has been a major problem affecting these programmes.

1.4 Education and Cultural Programmes

The local SSM cadres have taken a considerable interest in promoting educational and cultural activities especially among women, children and

youths. The relevant activities include organization of English classes for local youths, establishment of village level libraries, organizing of religious activities and cultural shows and recreational activities, especially family gatherings at the village level.

1.5 Training Programmes

Many types of training programmes are conducted by Sarvodaya workers. The workers at each level are responsible for training those below them. Finally the village level workers are expected to transmit their knowledge and skills to community members. Each category of Sarvodaya workers i.e., pre-school workers, malaria workers and health workers receive a general training in Sarvodaya concepts and approaches as well as a specialized training in the technical aspects of the relevant fields.

1.6 Health and Sanitation

There is a total of 21 health centres established and maintained by Sarvodaya in various project villages. Each health centre has facilities for treating minor ailments prevalent in the area. A health worker trained by Sarvodaya provides the necessary services. These services are free of charge, but the cost of drugs is recovered from the patients so as to sustain these establishments on a self-financing basis. The other Sarvodaya activities in the area include establishment of wells and latrines under the Rural Technical Services (RTS) programme of Sarvodaya.

2. Relationship between Malaria Control and other Sarvodaya Activities

Even though there is still some degree of aloofness between the malaria control staff and other Sarvodaya workers, a broad pattern of cooperation between malaria control and other Sarvodaya activities has gradually evolved. The malaria control staff approaches the communities through Sarvodaya structures which also provide various other benefits and services to the local people. The malaria control staff directly mobilizes the relevant community organizations in carrying out the required malaria control and surveillance activities. The Project Manager, EAs and FAs are directly involved in regular Sarvodaya activities such as family gatherings and shramadana camps which therefore facilitate the coordination of various field operations.

At the village level, too, there is considerable cooperation between the Community Organizer and the other Sarvodaya workers. The CO and health worker team up in most primary health care activities. Each worker is able to 'fill in' for the other when the need arises. The pre-school worker often finds that the children do not attend the pre-school when they or their family members are ill with malaria, and encourages the CO to visit the relevant families and provide treatment. The pre-school buildings are also used as a venue for various village meetings including those relevant to malaria control. Finally, common avenues for improving income and promoting malaria control must be explored in future. In this regard it is important to further investigate the possible role of cattle as a means of distracting the vectors away from the human hosts.

CHAPTER SEVEN

Conclusions and Recommendations

In this final chapter an attempt is made to identify some general lessons that can be learned from the experience of the SMCRP up to now. The long-term viability of the processes started by the project will be examined. Finally certain suggestions concerning the future direction of the SMCRP will be made.

1. Summary of Findings and their Implications

The results of the SMCRP up to December 1986 mainly relate to five areas listed below:

1. Malaria surveillance through community action.
2. Development of a PHC approach to malaria control.
3. Prevention and control of malaria epidemics through community action.
4. Intersectoral collaboration in malaria control at the village level.
5. NGO involvement in malaria control.

Each of these issues are critically important for the broader question of community participation in malaria control. The findings in respect of each of the above issues are discussed below.

1.1 Malaria Surveillance

To what extent, in what ways and under what conditions can trained community members contribute to vector, parasite and broad epidemiological surveillance required for keeping local malaria incidence under control throughout the year?

The SMCRP findings up to now indicate that community members with a suitable educational background can be trained to identify the vector at its larval and adult stages and monitor where and to what extent it breeds in the local area. Further, it was found that village level workers can successfully and routinely carry out the required vector surveillance operations over a long period of time provided they are paid a reasonable monthly allowance for their service, and receive adequate guidance, supervision and support from entomologists with access to simple laboratory facilities.

With the available results it is difficult to say how far the same community members can be trained to undertake parasite and broad epidemiological surveillance as a part of their routine duties. On the whole it can be suggested that the surveillance procedures to be carried out by village level workers should be simpler and less demanding than those currently adopted in this project. In particular, it appears that the village level workers cannot cope with three monthly mass blood surveys. The system of family records also needs to be further simplified. The possibility of such records being kept by suitably trained family members themselves should also be explored.

Further efforts are necessary to develop the existing system of surveillance under the SMCRP as a basis for suitable community action. At present it is not possible to determine how far the knowledge of the community at large concerning the levels of vector breeding and malaria transmission in the area has improved as a result of the project. The results of surveillance should be explained to the community members periodically at meetings held by Youth Groups, Mothers´ Groups, Shramadana Samithi etc. Simple techniques and formats for visual presentation of the data for the benefit of the community should be developed. On the whole the surveillance process should inspire, guide and facilitate suitable community action for reducing vector breeding and people´s exposure to the vector. Another important finding is that the cost of surveillance and the time involved must commensurate with the potential benefits to the community from the relevant malaria control measures.

1.2 Development of a PHC Approach to Malaria Control

Among other things the SMCRP sought to develop a suitable first level of prevention and control of malaria applicable to local villages. An attempt was made to discover what the individuals, families and local communities can do best in order to keep malaria incidence in the local area under control.

Table 16 presents a range of preventive and curative practices that may be developed as components of PHC approach to malaria control.

Only some of the methods stated in Table 16 are currently used in the SMCRP. The results of the methods used up to now are encouraging, but it is necessary to develop other appropriate methods to be used in combination with the existing ones. The appropriateness of the relevant methods for community use and their efficacy and cost-effectiveness must be clearly established before they are recommended for widespread community use. The experience of the SMCRP up to now indicates that there is a whole range of traditional practices that may be revived, developed and used in combination with modern ones in developing a suitable PHC approach to malaria control. On the whole there is much scope for developing methods of personal protection and those for reducing vector breeding as part of a PHC strategy in malaria control.

Table 16: Possible components of a PHC Approach to Malaria Control

Goals	Methods	
	Traditional	Modern
Reduction of vector breeding	Use of proper irrigation practices	Application of chemical insecticides
	Use of shramadana labour for elimination of vector breeding sites	Use of non-toxic larvicides
	Precaution against creation of man-made vector breeding sites such as borrow pits, wells etc.	Use of biological control methods such as larvivorous fish
Personal Protection	Burning of selected herbs for driving away the mosquitoes	Use of bed nets
	Use of cattle for deflecting vector away from human targets	Cooperate with FS & MBS as necessary
	Use of proper clothing specially at peak biting times	Chemo prophylaxis where necessary
	Avoidance as far as possible of places directly exposed to permanent vector breeding sites in selecting locations for home building	
	Readjustment of sleeping habits as necessary for minimizing exposure to the vector	
Treatment and cure	Use of appropriate herbal medications such as pas tel tambuma	Use of recommended course of chemical drugs

1.3 Prevention and Control of Malaria Epidemics

The strategies developed for prevention and control of malaria epidemics under the SMCRP include continuous vector surveillance in the selected villages, intensive parasite surveillance through periodic FSs and MBSs, and the simultaneous and intensive application of all three methods of vector control developed so far in the project in potential epidemic situations.

The combination of methods currently in use may only work in regions where periodic upsurges in vector density are the primary cause of the periodic outbreak of malaria epidemics. Where an influx of non-immune people into a malaria endemic area leads to epidemic outbreaks, other methods of control such as mass drug administration, prophylactic treatment and intensive application of chemical insecticides may become necessary.

On the whole the experience gained so far by the project in dealing with malaria epidemics is quite limited. Apart from the special case of Ethnugama noted earlier no malaria epidemic of any consquence has been reported in the project area since the beginning of the project. The available data do not indicate that any of the interventions currently used in the project has been able to cut off the annual peaks in malaria incidence in the relevant villages. On the other hand no malaria deaths have been reported in any of the project villages since June 1984. Although there is a reported increase in the number of P.f. cases in the Anuradhapura District as a whole since 1984, no such trend is evident in the project area. However, no systematic comparison of malaria trends in the SMCRP area and those in its neighbouring regions covered by routine programmes under the AMC is possible at present due to the non-availability of comparable and reliable data for any of the neighbouring regions.

As in many of other preventive health programmes, one practical difficulty encountered by the project is the difficulty of developing a mechanism whereby the local communities can be continuously alert and ready to the possibility of recurrence of malaria epidemics. It is much easier to motivate communities to deal with immediate problems than to prepare them for avoiding future emergencies. It is even more difficult to motivate the communities to accept a certain level of malaria transmission as natural and inevitable. With the exception of the limited example of Ethnugama, there is no concrete proof of either the viability or effectiveness of community-based efforts in the prevention and control of malaria epidemics.

1.4 Intersectoral Collaboration in Malaria Control at the Village Level

The experience of the SMCRP over the past few years indicates that the following extraneous operations must relate meaningfully and positively with the malaria control efforts at the village level.

1. Irrigation management.
2. Construction of infrastructual facilities including roads, irrigation systems and houses.
3. Construction and maintenance of wells, tube-wells etc.
4. Agricultural operations including chena farming and animal husbandry.
5. School and pre-school education.
6 The PHC operations at large.

At present no specific formula is available as to how malaria control efforts at the village level should collaborate with each of the above activities. Some useful guidelines, however, could be developed through future research.

1.5 NGO Involvement in Malaria Control

What are the advantages and disadvantages of a popular voluntary organization in serving as a catalyst and a promoter of community based malaria control? Often government agencies do not have the capacity or the mass appeal needed for successful mobilization of rural communities for such an effort. Further, their rigidity of approach, bureaucratic red tape and the lack of response to community needs often make it difficult for the government agencies to work closely with the relevant rural communities over a long period of time.

The results of the SMCRP reveal that organizations such as the SSM can usually do a better job in promoting suitable community actions. An NGO can be innovative and highly responsive to the local needs as necessary. The capacity of a community-oriented NGO to attract and absorb specialists and technically competent persons, however, may not be very high. The rapid turnover of technically competent staff is likely to be an important problem affecting programmes initiated by such organizations. For example a continuous surveillance of the parasite and the vector may be difficult to achieve where staff turnover is high.

It is important that where NGOs are directly involved in promoting malaria control through community action, their efforts should complement, supplement and broadly correspond with the objectives of the relevant national malaria control programme. Further, the methods/procedures used must be simple enough for the local communities to implement them effectively with required minimum technical support from the relevant NGO and the national malaria control programme. Their capacity for large scale mobilization of community action is the primary strength of NGOs as related to community-based malaria control efforts.

In summary, the services of suitable NGOs may be used effectively as a means of enhancing community participation in malaria control.

2. The Use of Research Results

As the SMCRP is a research cum action programme, it is expected that research results are used directly for relieving the malaria situation in

the project villages. The new knowledge gained about the vector, parasite and the role of human behaviour in the transmission and control of malaria in the local area is to be used directly in the prevention and control of malaria epidemics in the local area. It is also anticipated that wherever possible the research results will be transferred to the local communities themselves so that they may be used by the respective local communities as an aid for community diagnosis.

The experience gained so far by the SMCRP may be quite useful to the AMC, the national malaria control programme in Sri Lanka, especially in view of its commitment to Integrated Vector Control with effect from 1982. The AMC was directly involved in the planning stage of the SMCRP, but later each organization decided to go its own way in developing suitable strategies for commuinity-based efforts in malaria control. However, fresh efforts to develop a working relationship between the AMC and SMCRP have been in progress since November 1986 following their joint participation in a workshop organized by the South Asian Cooperative Environment Programme (SACEP) and the SSM. Among the other local agencies, the District Development Council in Anuradhapura, the public health authorities in the local area, and staff of the Ministry of Mahawell Development in a nearby region have shown considerable interest in the strategies pursued by the SMCRP and their results. Copies of the present report will be made available to each of the relevant local agencies.

From 5 to 11 November 1986 the vector control specialists, researchers and programme administrators from 6 countries in South Asia gathered in Sri Lanka for a workshop on Integrated Vector control using Community Participation, organized jointly by the SSM and SACEP. The experience of the SMCRP was a major focus of deliberations at this meeting. Both foreign and local participants including the senior staff or the AMC made a field visit to the project area from 7 to 10 November 1986. The team commended the SMCRP for its achievements and noted that it provides a useful model for the Asian region. Thus the lessons learnt from the SMCRP up to November 1986 were disseminated widely in South Asia through this meeting.

3. Suggestions for Future Action and Research

1. It is necessary to refine and develop further the surveillance and malaria containment strategies presently used in the SMCRP.

2. Efforts must be made to obtain better cooperation among various collaborating local institutions involved in the SMCRP including the SSM, AMC and the local universities.

3. The vector biology component of the project should be strengthened with inputs from the AMC and other relevant institutions collaborating in the project.

4. In its future vector control research the SMCRP must aim at further understanding the breeding, resting and biting habits of local vectors, further development of biological control methods including

the use of larvivorous fish and use of cattle as a substitute for the human host and development and testing of appropriate larvicidal methods.

5. The future behavioural science research under the SMCRP must focus on the knowledge, attitudes and practices of the local people as related to malaria control and transmission: the possibility of intersectoral collaboration between agricultural and livestock development on the one hand, and malaria control on the other: the ways of improving the efficiency, effectiveness and long-term viability of malaria control workers at the village level; the potential use of indigenous herbal remedies in malaria control and the long term prospects for community-based malaria control in the light of emerging social changes.

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